# AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

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ENTERED AT POST OFFICE, NEW YORK, AS SECOND CLASS MATTER.


## Standard Rapid-Feed Planing and Matching Machine.

This is a machine designed to meet the requirements of heavy work on hard timber, or for the rapid production of flooring, beading, novelty siding, etc.

The frame is 12 feet in length, cast hollow, tied together by struts at close intervals.

It will plane one or both sides, and match 8″, 14″ and 26″ wide, and 6″ thick; also bead, rabbet, or cut any kind of siding on one or both sides.

The upper cylinder is 8″ diameter, and has four wings, two of which are slotted to provide for the use of beading and siding cutters. The pressure bar on the rough lumber is arranged to swing or yield eccentric with the cylinder head; it has a pivoted shoe or weighted bar that bears close to the knives, no matter what the thickness of lumber may be.

The pressure bar on the finished lumber is yielding, to a limited extent, for wet or resinous lumber. It is adjusted with the cylinder, which is inclined and is gibbed to heavy uprights; any change for thickness can be made while the machine is running. The finishing roll is also so connected as to be raised or lowered with the cylinder.

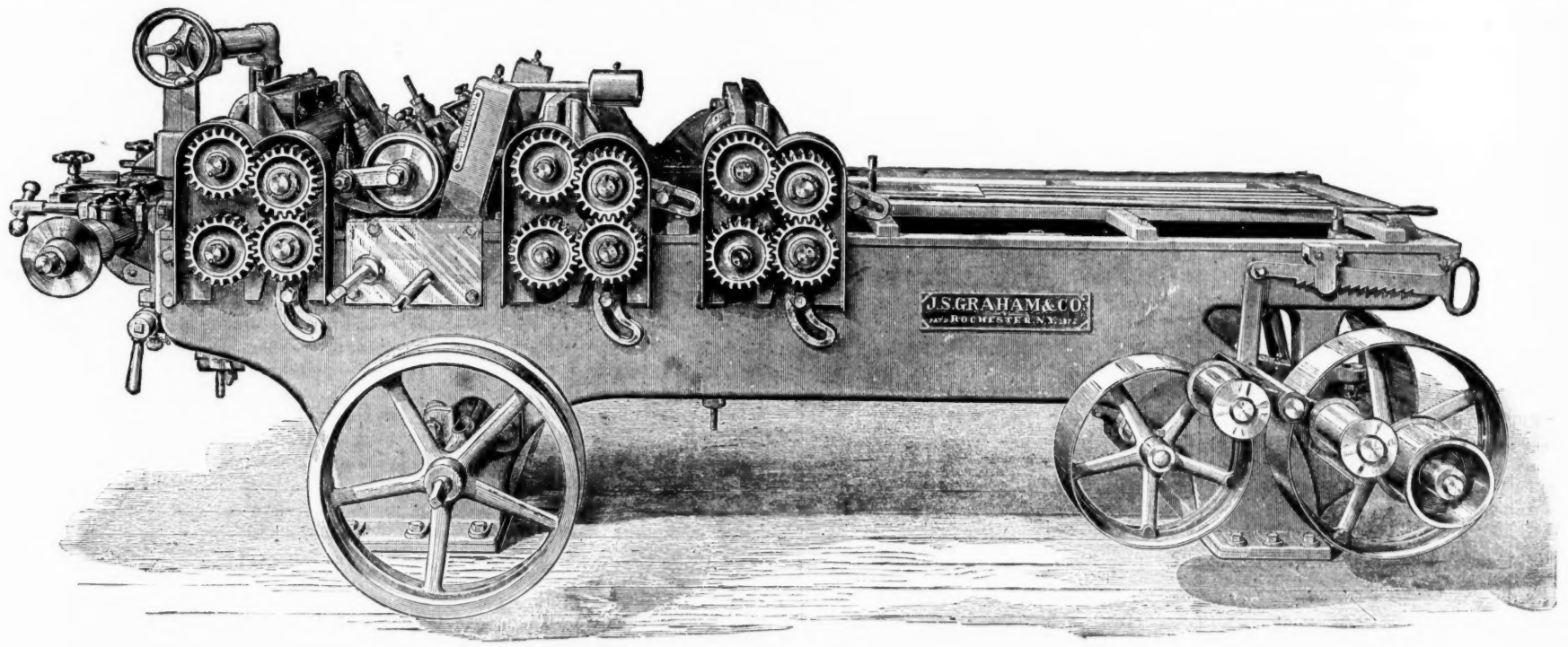
The under cylinder, 6″ diameter, also, has four wings, two of which are slotted for the attachment of special cutters. This cylinder is also arranged for alterations for thickness with the machine in motion, and has separate adjustment to compensate for wear of knives, boxes, etc. The arrangement is such that the whole cylinder may be instantly exposed for inspecting or changing the knives.

The matching heads are 6″ diameter, with three wings. The shafts are tool steel, with self-oiling and adjusting step.

The rolls are 7″ diameter, coupled with expansion gearing to yield to inequalities. The rolls are simultaneously adjusted while running.

The feed of machine is from 40 to 90 feet per minute. The weight of machine is from 6,000 to 9,000 lbs., according to width and number of cylinders.

It is made by J. S. Graham & Co., Rochester, N. Y.




STANDARD RAPID-FEED PLANING AND MATCHING MACHINE.

## Locomotive Engine Running.

BY ANGUS SINCLAIR.

ADHESION, TRACTION, AND HORSE-POWER—CALCULATING POWER OF LOCOMOTIVES.

The capacity of engines is generally expressed in horse-power, which is a measurable quantity, but for several reasons that method of indicating power has not been applied to the locomotive. When practical railroad men hear the size of cylinders, the diameter of driving wheels, and the boiler dimensions of a locomotive mentioned they understand what kind of service the engine is adapted for, and about the weight of train it can haul. As it has been found necessary for designing and other purposes, to estimate with some degree of accuracy the work a locomotive is capable of doing, it has become usual to reckon the power of a locomotive by the tractive force it can exert upon the rails.

PROPORTION OF ADHESION TO TRACTION.

Tractive force is the power which the pistons of the engine are capable of exerting through the driving wheels to move the engine and train. The efficiency of the engine's traction is dependent upon the adhesion of the wheels to the rails, for where the adhesion is insufficient the pistons will slip the wheels, and no useful effect will result. To prevent the wheels of ordinary American engines from slipping on dry rails, the weight resting on the drivers must be about five times the power exerted by the pistons to slip the wheels. To prevent slipping on wet, unwashed rails, more than double the above weight would be needed. In practice, locomotives are not provided with weight enough to prevent the wheels from slipping on a greasy rail, as the sand boxes provide the means of obtaining adhesion where the rails are in bad order. A common practice is to place upon the drivers weight equal to about six times the power exerted to slip the wheels, which leaves a small margin for wet rails. Many locomotives have power sufficient to slip the wheels on dry rails, but such engines generally have boilers too small for the cylinders, or the distribution of weight on the drivers is badly effected.

ESTIMATING TRACTIVE POWER.

The easiest way of calculating the tractive power of a locomotive is by use of the following simple formula first propounded by Pambour. The rule is empirical, but it will be found correct enough for all practical purposes when tested by more elaborate calculations:

$$T = \frac{d^2 \, L \, p}{D}$$

$d$ = the diameter of the cylinder in inches.
L = the length of the stroke in inches.
D = the diameter of driving wheels in inches.
$p$ = the effective mean pressure on the piston in pounds per square inch.
T = the equivalent tractive force at the rails in pounds.

Which, given in plain terms, reads: Square the diameter of piston in inches, multiply by the length of stroke in inches; multiply by the mean pressure of steam per square inch, and divide by the diameter of the drivers in inches.

We will apply the calculations to the case of the standard Buchanan passenger engine, the cylinders being 17x24 inches, the drivers 68 inches in diameter, and the effective pressure on pistons about 80 pounds. The problem is worked thus:

17 in. dia. of cylinders.
17

289 = square of diameter.
24 in. stroke of piston.

6936
80 lbs. per square inch.

Dia. of drivers, 68)554880(8160

This gives 8160 pounds as the pressure exerted to turn the drivers, which may be accepted as a close approximation to the truth. In using this formula, the mistake has frequently been made of taking the quotient to represent the power developed by one cylinder, when in fact it gives the power of both.

A method of calculating the locomotive traction that is a good deal followed by our engineers is, to ascertain the foot-pounds of work the engine is doing during each revolution of the drivers. By dividing the total thus found by the circumference of the drivers in feet, the force exerted through each foot that the engine moves is found. Taking the same engine, the pistons 17 in. diameter, give 226.98 square feet area. This is multiplied by the mean effective pressure of steam, giving 226.98x80=18158.4 pounds pressing on each piston through the whole stroke of 4 feet.

18158.4
2 pistons.

36316.8
4 feet of stroke.

145267.2

These figures show that 145267.2 foot-pounds are exerted during each turn of the wheel, whose circumference is 17.8024; therefore 145267÷17.8024=8160, the number of pounds exerted through each foot moved.

There is still another way of figuring out tractive power by calculating the rotational force and the leverage through which it is applied to the locomotive wheels. The pressure of steam on the piston is productive of two strains on the crank axle. When the crank is on the dead center, the pressure upon the crank-pin forces the axle against the axle-box without causing any tendency to rotate; but when the crank-pin is on the quarter the full leverage of the crank is available for rotation, the leverage increasing gradually as the crank gets away from the center. The mean effort upon the crank-pin during one revolution of the crank is to the effort of the piston as .6366 is to 1.

Now, to find the traction of the locomotive, we multiply the length of our crank, which is 12 inches, by .6366, which gives 7.64 as the length of the crank receiving constant pressure from the pistons. The aggregate steam pressure has already been found to be for each piston 18158.4 pounds. This is multiplied by 7.64, and the product is divided by the radius of the wheel, which is 34 inches, giving as a quotient 4080, being the power exerted on one side of the engine. That, multiplied by 2, gives 8160 pounds—the same as was found by the other two methods.

HORSE-POWER OF LOCOMOTIVES.

When people wish to find the horse-power developed by a locomotive the indicator is generally employed, and the calculations made from the card. Others figure out locomotive horse-power as they do that of other engines. By this method the engine whose traction we have been investigating, might have the horse-power calculated as follows:

226.98 square inches cylinder area.
80 pounds mean pressure.

18158.4 piston pressure.
4 ft. piston travel each revolution,

72633.6
2 cylinders.

145267.2
145 revolutions per minute.

20063944÷33000=608 horse-power when running at a speed of 30 miles an hour.

No allowance has been made for frictional losses in any of these calculations.

## Improvements of the Locomotive.

Messrs. Wm. Woodcock and Amos Pilsbury, the committee appointed to investigate this subject, reported to the American Railway Master Mechanics' Association:

We find that the past year has been like the preceding two years—years in which very little change or improvement has been made.

We may assume this arises from the fact that the business on the railroads has considerably diminished, and it was not a very favorable time for experimenting.

While there is still room for improvement of the locomotive, the field is diminishing. We consider the locomotives of the present day well adapted for the service required. It is only by comparing the locomotives of the present day with those of the past, that we note the great changes that have been made. Our attention is called to this very forcibly in noting the photograph of the locomotive "Old Ironsides" (the first locomotive built in the United States) in comparison with the locomotive of the present day. By these we see the improvement and change made.

Among the improvements noted as having been made the past year, is a boiler for a locomotive, known as the "Coventry Boiler." A blue print of same is kindly furnished by H. C. Brooks, president of Brooks Locomotive Works (at which works this boiler was built, and is). It is known as a return flue boiler, having forty-three (43) 3-inch return flues, the smoke stack being placed over the crown sheet.

Jacob Johann, Esq., general master mechanic of the Wabash, St. Louis and Pacific Railway Company, writes on this subject as follows: The general tendency among American master mechanics seems to be towards building larger boilers, thereby increasing the heating and water capacity, and in my opinion this movement is in the right direction, especially in the case of fast-running engines that are required to handle heavy trains. The increased piston speed necessitates an increase in the capacity of the boilers, to furnish the steam required to maintain such increased speed, and no matter what other improvements or perfections a locomotive may have, if the boiler is not capable of furnishing all the steam that is required under any and all circumstances, you can safely predict a failure as being the result of neglecting one of the most vital parts of a locomotive.

Another tendency is towards increasing the working pressure of the steam, thereby necessitating a stronger boiler, and requiring the giving of more attention to the material of the boiler and fire-box, the manner of riveting, and the strength of the bracing.

Every advance in this direction secures more effective work from the evaporation of a given amount of water.

The great desideratum in a successful and economical engine consists in having as large a boiler as possible, with a maximum heating surface, and so designed as to carry a working pressure considerably above the ordinary practice. In neither of these directions, in my opinion, has the limit been reached, and he who first reaches the limits in these three directions will be the first to secure the fastest and most powerful locomotive, under given conditions.

As a matter of course, there are minor details that must be improved in proportion, but the credit of making the greatest improvement over the American locomotive of to-day will be to the one who first designs a boiler that in practice will furnish an abundance of steam under every circumstance that may be brought to bear in the working of the engine. As the past history of events has proven, apparent improbabilities have become not only probabilities, but actual realities.

Mr. Alexander Mitchell, superintendent of the Lehigh Valley Railroad Company, has furnished your committee with blue prints of a locomotive designed by him for heavy mountain service, also photo of same. The general dimensions are as follows: The boiler is 54 inches diameter at front end, material "Otis steel;" fire-box 11 feet long; flues 238 in number, 2 inches outside diameter, 12 feet long; cylinders 20″x26″, with 50″ drivers, and weighs 108,000 lbs.; has flange tire on the first, second, and third, and plain tires seven inches wide on the fourth or rear pair of drivers, and has a single wheel or pony truck front and back, having 5½ tons on the first and 4½ on the latter truck, the object being to get a large engine for heavy service with a short, rigid wheel base.

The front truck is equalized with the first and second pair of drivers, the third and fourth pairs are equalized, and the rear truck takes its own weight, having a deep pocket with long spiral springs on the center plate and volute springs over the boxes.

He says the engine curves and hauls very well, but cannot give you data sufficiently accurate as to either. Blue prints of engines built on this plan, are shown on a curve of 330 feet radius. You will notice that the engine with five pairs of drivers has flanges on the front, whilst the rear has a plain tire, and the other has plain tires both rear and front.

From the *Locomotive Engineer's Journal* we learn that at Big Springs, Texas, a meeting of railroad mechanical men, at which the Mayor of the town presided, was held in the city hall to bid a formal adieu to Mr. E. A. Salisbury, Division Master Mechanic of the Rio Grande Division of the Missouri Pacific Railroad. Under the lead of the Division of Locomotive Engineers a farewell feast was given to Mr. Salisbury, and he was presented with a purse of three hundred and fifty dollars, raised among the men.

## Boiler Chimneys Considered from an Economical Standpoint. — Intelligence vs. Ignorance in the Fire-Room.

BY GEORGE MARSHALL.

Considering the fact that the steam boiler, studied in the light of economy, is really the most important part of any manufacturing interest where steam is used for power, it is to be wondered at that steam users pay so little attention to the general efficiency and economic duty of their steam generators. Their care, in the majority of instances, is intrusted, from their purchase to their consignment to the scrap dealer, to men who give the least study and thought to the proper efficiency and best development of this, the very life of properly and economically managed concerns.

In the development of the proper economy of a steam boiler, attention is seldom given to the proper area of the chimney, or smoke stack. In case the latter is part of the boiler purchase, the matter is generally left to the opinion of the boiler builder, who on his part only considers the stack in the light of additional profit from its manufacture, paying no attention to the fact that the evaporative power of the boiler can be greatly increased by a proper proportion of the stack to the tube area.

When a chimney is to be built, it seldom happens that consultation is had with those competent to give advice on such subjects, seemingly the only thought being to have it erected at the least outlay and with the least trouble. In the accomplishment of this purpose, the builder of the factory may be consulted with regard to the proper size and height which may be required for the boiler draft; and as it seldom, if ever, happens that the builder has any experience in engineering matters of this kind, he is more apt to be guided by the dimensions of chimneys in other factories erected by him than he is to seek advice from those who could only give it after bestowing time, thought and study to all the requirements of the case, taking into consideration that while the number of boilers may be the same, the tube area may be disproportionate, or the surroundings of such a nature as to require radical changes to be made in construction, in order to fully develop the economical duty of that part of the plant where the greatest economy or waste may take place. When it is taken into consideration that changes in construction of chimneys may effect a saving of thousands of dollars in the ordinary life of a steam boiler, the importance of a careful consideration of this subject cannot be too highly estimated. It frequently happens that while one man may be losing money, another is making it by careful attention to the steam part of his plant.

Boiler efficiency is greatly affected by the draft, and as the draft must be either natural or artificial it will readily be seen that the chimney plays a very important part in the economy and efficiency.

Natural draft is caused by the difference in temperature between the atmosphere and the gases produced from the fuel, while artificial draft is caused by fans or blowers and steam jets, either of which require boiler power to produce, and as a consequence their production or use is attended with cost. It rarely happens that natural draft, efficient, economical and sufficient, cannot be produced by a proper attention to the construction of chimney. Should such be the case, artificial means may be necessary in order to produce the best results. It frequently happens that a chimney, originally built for one boiler, is required, owing to increase of business and the purchase and use of additional boiler power, to do a duty far beyond its capacity. In such a case, waste of fuel may result.

From experiments it has been pretty conclusively proven that about twenty-eight per cent. of the heat generated by combustion is required to produce sufficient draft, and as the unconsumed products of combustion are greatly accelerated in their escape from the furnace or boiler by the use of artificial means, while the efficiency and duty of a boiler may be increased, the increase is done regardless of economy, either in fuel or durability of the boiler. It is claimed by some that artificial draft is more economical in consumption of fuel, owing to high combustion and increased temperature of gases and increase of generative efficiency; yet I have never personally had satisfactory proof of the correctness of this claim. While not disputing the correctness of this, I still say that from practical knowledge the durability of a boiler is greatly reduced, and this must of necessity be so from the high combustion claimed by the advocates of artificial draft, affecting, as it does, the nature of the material of which a boiler is constructed, and resulting in overheating, if not actual burning of the metal.

The efficiency of the draft is not altogether due to the height or area of chimney, but is also affected by the quantity of air admitted to mingle with the gases, as well as the condition of the atmosphere. Draft can also be affected by the quality of fuel, which may be of such a nature as to require a greater or less area of chimney. Where the surroundings prevent the erection of a chimney of sufficient height, resort must of necessity be had to artificial means. This may also be necessary where the chimney originally designed for one boiler is made to do duty for two or more. In this case, the least risk in regard to durability is reached by careful attention on the part of the engineer or fireman to prevent an unnecessarily high temperature.

Unfortunately, the handler of the shovel is most generally employed, not for his ability in matters of this kind, but from the low rate at which his services can be engaged. Not infrequently, when expenses are to be reduced, the competent engineer is the first one whose services are dispensed with, and the fireman or cheaper man engaged in his place. True economy is seldom, if ever, advanced by resort to measures of this kind, as the competent man may by careful study have reached the maximum of duty at the minimum of fuel consumption; and the substitute, if possessed of brain capacity sufficient to arrive at the same result (which is seldom the case, not being hired for brain capacity), can only do so after a long time and the unnecessary consumption of much coal.

The setting of the boiler or boilers should also receive close attention, as the efficiency can in this way be greatly affected. Yet few steam users understand that the purchase of a few thousand more bricks to be used in the setting may affect their pockets to the tune of more than the entire cost of setting, not in years, but in months.

Were engineers of experience employed to compute the losses sustained by the steam users of this country every year from the causes already enumerated, the array of figures would be alarming; yet it would be safe to say that fully ninety per cent. of the boilers in use to-day are run without any attention to the constant waste taking place from one or other of these causes.

Brains are required as well in the coa shoveler as in the office, and where this is understood, economy does not always commence in the fire-room. It happens, however, that even where strict economy is practiced, and intelligence employed on the part of the engineer or fireman in charge of boiler, the efficiency is impaired by a poorly designed chimney or an improperly constructed smoke stack. Within the memory of the writer the prevalent opinion and practice of intelligent constructing and consulting engineers was to have the base of the chimney of large area, and the opening at top greatly reduced. The present practice is the reverse of this, and it is now no uncommon thing to have the plan of chimney drawn to show an increased area at the top. For chimneys of this design a greater efficiency is claimed, owing to the expansive nature of the gases after the performance of their duties, and a consequent addition to the draft by reason of the freedom of liberation. Boiler builders look to a great extent to engineers of ability for a perfect understanding of such matters, but it should be the duty of intelligent boiler makers to understand all data of this nature, in order to accomplish the most economical results from their productions. The proprietor of a boiler shop who studies only the work of his hands without due regard to the successful accomplishment of economical results from his labor, must of necessity be greatly dependent on those who use their brain power, and until the boiler builders of the country can be brought by education to the necessity of perfectly understanding the results and proportions required by their customers in producing the greatest economy from the steam boiler and its appliances, it must be expected that engineers instead of boiler makers will be consulted in matters of this nature, which should properly belong to a competent boiler builder. A general condemnation of all boiler builders is by no means intended, as there are many of the guild who are far more competent to express an opinion on the general efficiency and economical duty of a boiler and its appliances

than many of the so-called consulting engineers; but the latter, by technical understanding and intelligent interpretation of the proportions required in the various parts of a plant for steam purposes, elbow their more intelligent neighbor aside while they rise, more from the ignorance of the parties who seek their services than from any real merit in themselves.

When a building is to be built, either for mill, factory, or dwelling, consultation is had with an architect of experience and reputation, and by him the plans are drawn as required to suit the taste and pocket of his employer.

Let the boiler builders show by their works and intelligence their ability to properly construct and intelligently explain the merits of their designs in boiler engineering, and it is safe to predict that much of the business now carried on by consulting engineers will be transferred where it properly belongs—to the intelligent, careful boiler engineer.

## The Blevney Split Universal Chuck Pulley and Universal Chuck Shaft Coupling.

In our issue of July 5th, we illustrated a plain "chuck" pulley made by the Blevney Manufacturing Company, Newark, N. J. We illustrate with this a split pulley made by them on the same plan so far as fastening to the shaft is concerned. As will be seen the halves of the pulley are held together by peculiar taper clamps, at the hub and rim. These clamps are made of malleable iron, with hooking end projections, inclined to each other, and a central rib forming a wedge. These clamps are placed in the mould where they form their own seat in a perfect manner. After casting and finishing the pulley the clamps can be readily removed to separate the halves, and when the pulley is placed on the shaft, inserting them securely locks it, making a neat and light pulley, and one that can most readily be put on or taken off the shaft.

The engraving of a shaft coupling represents one made by the same company. It consists of a plain cylindrical sleeve, threaded at the ends for screw rings, one of which is shown detached. These screw rings are bored about $\frac{1}{8}''$ larger than the shafts to be coupled. The inner face of these rings work against the ends of three taper jaws, fitted in the sleeve in such a way that their concave surfaces are parallel with each other, and with the axis of the coupling. These jaws are made with ribs running parallel with their taper surfaces, which serve to guide them and to retain them in their seats, which are formed by casting the metal around them. In moving the screw rings inwardly the jaws are carried along longitudinally, and at the same time by their wedge shape towards the shaft which they approach centrally, like the jaws of a universal chuck, pinching it with a force due to the pitch of the screw thread and the taper of the wedge.

The movement of the jaws, and their form, permit the use of this coupling on shafts that vary $\frac{1}{8}''$ or $\frac{3}{16}''$ from standard size, and with special construction of jaws two shafts greatly unequal in size may be coupled. The bearing surfaces of the jaws are bored slightly smaller than standard size of shaft, so as to give full bearing under pressure, after which the jaws have only to be moved back to increase the diameter of the hole. In this way the coupling is slipped on the ends of the shafts, when by screwing up the collars they are coupled.

Although the grip of this coupling is very strong, a feather may be inserted if desired. When this is done it is only necessary to remove one of the jaws and use the same tool for slotting that is used on the shaft.

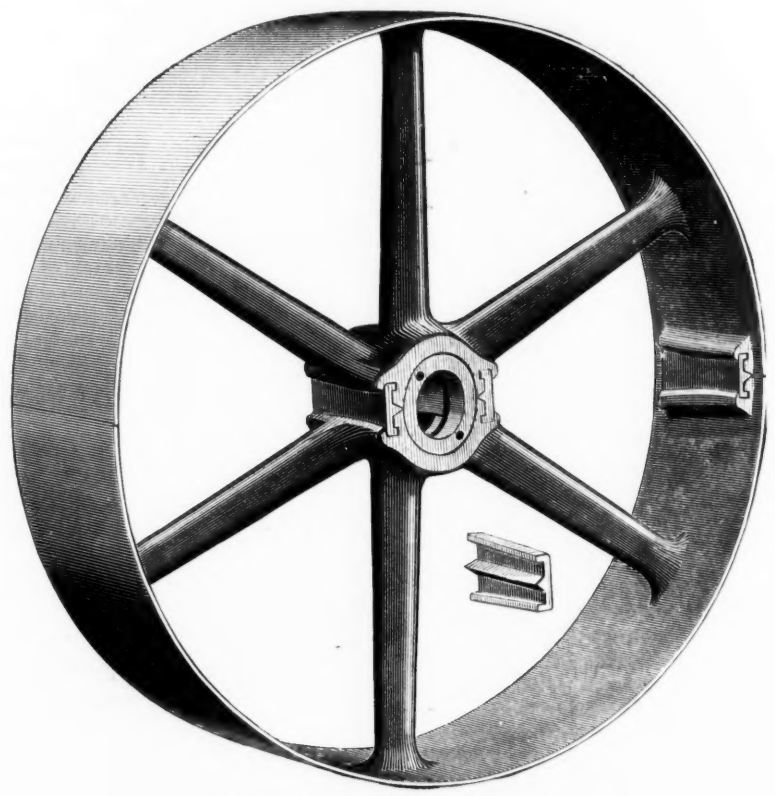
The hook and strap shown is for withdrawing one of the jaws when it is required to loosen the coupling.

These couplings are made in halves when desired, this construction being convenient when it is desirable to align the shafts before coupling them, as they may be coupled without moving in the boxes. When so made they are clamped together similar to the split pulley. The general neat appearance of the coupling may be inferred from the engraving.

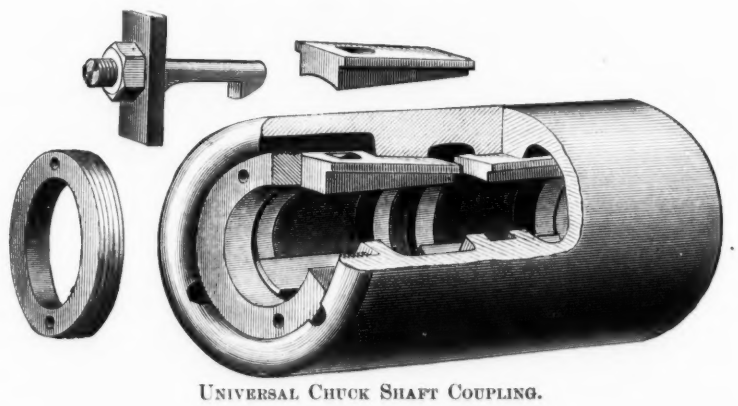
## American Machinery in Brazil.

The British Consul at Santos in the course of his report to the home government, says:

"Without going beyond the limits of a measurable future, it may be taken for granted that within the next fifty years many thousands of miles of railroad have to be constructed, requiring immense quantities of rails, rolling stock, etc. Many hundreds of square miles of new lands will be brought under cultivation, requiring agricultural implements; many new industries will be started, requiring the most approved machinery; and lastly, many thousands in sterling money will be needed to carry out urban improvements and rural developments. All this is fuel for active trade and enterprise, and has its basis in gold, coal and iron. Up to the present time Great Britain has had the monopoly of them, and there is no reason why she should not retain it. However, in the matter of iron, she must prepare for competition from the United States. The Americans have lately furnished some of the new railroads with rolling stock, and their agricultural implements are beginning to attract notice. It is the traditional thin edge of the wedge they are working in, and the British manufacturer had better look to it, by supplying the market with the most suitable materials, before the Americans obtain too strong a leverage on their wedge, for a trade once lost is hard to regain."



SPLIT UNIVERSAL CHUCK PULLEY.



UNIVERSAL CHUCK SHAFT COUPLING.

## A New Electric Railroad.

What is spoken of as the first commercially successful electric railroad in America has lately been tried in Cleveland, O. The cars were run over a mile of road, and the company making the experiment deemed it so satisfactory that they have announced their intention of extending the system at once to their whole range of lines reaching a length over twenty miles. The system of electric propulsion used is a combination of the Brush and Knight and Bentley systems, the current being carried on underground conductors laid in conduits like those of the cable roads. The cars were started and stopped with the greatest ease, and there was said to be no tugging and jarring like what is common with horse and cable cars. To an unprejudiced observer the success of the opening was not altogether overwhelming for the speed attained was only two miles an hour, that ungiddy pace being attributed to faults in the machinery. We trust that before the whole twenty miles are ready for electric propulsion the machinery will be in such order that it can be induced to inspire a little more activity to the wheels of the car.

The immense centrifugal force of a rapidly revolving wheel was recently well illustrated by the bursting of a fly-wheel at the Solar Iron Works, Pittsburgh. The fragments of the wheel tore through the building where the engine was located, and a heavy piece struck a mill nearly 1,000 feet distant.

From Mexico we learn that energetic measures are being taken to give that country's industrial interests proper representation at the coming New Orleans International Exposition. An extensive area of Mexico is well adapted for the cultivation of the cotton plant, and it is expected that the influence of the exposition will be to stimulate Mexican land owners and capitalists to develop a native cotton industry.

We extract the following from the *Nashville Daily American* of July 20:

"For some months past the authorities of the Japanese Imperial University at Tokio have been considering the most suitable place at which to have built an extensive collection of models and machinery for the Engineering Department of their university.

"An informal letter was received some days since by Prof. O. H. Landreth, of the Vanderbilt Engineering School, and yesterday the official document arrived ordering:

"A model of wrought iron highway truss bridge six feet in length, to be built in brass.

"A small working compound steam engine, with expansion gear and reversible gear.

"A small working iron turbine water-wheel with water governor and sluice gate.

"Two differently constructed cast iron models of steam engine pistons with metallic packing rings.

"A working model of engine's slide valve and expansion valve, with adjustments and appliances for indicating the relative positions of piston and valves at any part of the stroke.

"A working model of a surface condenser for a compound engine.

"A working model of an improved pendulum governor for steam engine, with adjustment for regulation of throttle valve.

"The work on the above list of machinery will be commenced in the school shops of the Engineering Department as soon as the session opens, and will be pushed ahead as rapidly as possible, consistent with good shop instruction for the engineering students, who will do the greater part of the work, and as the number of students will be sufficient, it is probable that duplicates of the above will be built at the same time.

"A small vertical engine, built largely by last year's engineering class, was intended for exhibition at the World's Fair at New Orleans during the coming fall, but cannot be spared, as it will be needed to run the blowing fan for the cupola of the foundry and for the forges which are too remote to take their power from the regular steam engine.

"The order for the truss bridge was accompanied by working drawings in blue print, which are very creditably executed. The other items of the order are to be designed as well as constructed at the Vanderbilt.

"The School of Engineering of the Tokio University is under the charge of Prof. J. A. L. Waddell, an American engineer of recognized ability."

## Two Explosions of Locomotive Boilers.

Within three days the morning dispatches have announced the occurrence of two explosions to locomotive boilers. In Cleveland, while a locomotive was about to start with a freight train, the boiler exploded with tremendous force, hurling the engineer and fireman, and a little girl who was near-by, into the air, but by surprising good fortune all escaped with their lives. This fact was the more remarkable, since the engine was torn to pieces and a freight car that stood near was shattered.

From Allentown, Pa., a more tragic explosion is reported. A locomotive belonging to the Lehigh Valley Railroad was returning home light. There were four persons upon the engine. When passing through an unfrequented part of the road, bordered with timber, the boiler exploded, and every person in the cab was instantly killed. Portions of the human beings were scattered far out into the woods. The engine and boiler were torn into fragments, and a chasm opened in the track. There being no person left alive to report the accident, a freight train came along shortly afterwards and ran into the wreck, causing great destruction of property and injuring several train men.

This boiler accident, leading to another that might have been more disastrous, is unique of its kind, although accidents to trains where none were left to tell the tale have not been unknown. Some years ago, on the New Jersey Central Railroad, a freight train ran through a trestle-work at night, and the whole train smashed down into a gully far below, so that every person on board was killed. No one being left to flag the next train, another heavy freight train came dashing along, and it also ran into the wreck, and most of the men on the second train were killed.

### Expanding Mandrel for Lathes, Milling and Wheel Cutting Machines.

Fig. 1, is a sectional view a this mandrel, with a flange which is bolted to a true face plate of a lathe or other machine.

Fig. 2, is a view of a mandrel to run in lathe, or between any centers.

Fig. 3, is a sectional view of a mandrel with a taper shank to fit milling, wheel cutting, or other machine.

Figs. 4 and 5, are elevation and end view of the die split in three pieces.

The engravings represent the construction of the mandrel, which consists essentially of three pieces. The body and taper spindle are forged of one piece of steel. A thread is cut on the boss, and the steel nut screws on to this thread. A recess is turned in this nut, into which the collar, or enlarged portion of the die, (see Figs. 4 and 5) rests.

The die is split in three pieces after being bored, reamed, and turned to the desired diameter. Figs. 1 and 2 show three keys in the taper spindle, these keys divide the segments of the die, and prevent them turning on the spindle.

In order to prevent dirt and chips entering between the die and the spindle, a spiral spring surrounds the die (see Fig. 2) and holds it in contact with the spindle. In Fig. 1 the die is shown stepped, so that it will hold pieces with two different sized holes; it is obvious that special dies can be made when required.

To secure the article of work to be operated upon on the mandrel, the split die is expanded by screwing up the nut, which draws the die along the taper spindle.

The grip or holding power of this mandrel is thorough, as the parallel die fills the holes in the articles. With this mandrel the necessity for knife edge tools, which are costly and not durable, is to a great extent obviated, as the work can be set in such position that it can be turned or faced on the boss, and all over the surface without change of tools. As there is no mandrel hammering required in securing work, breakages are avoided and the mandrel does not receive this hard usage.

The range of work for which this mandrel can be used may be readily increased by using split bushes on the die, which can be changed from one size to another in a moment. By cutting a thread on the die or on a split bush, large nuts can be squared on their faces true with the thread and in less time than usual.

These mandrels are designed for use on all classes of heavy, medium and light work. They are now being got up to suit the requirements of watch tool makers.

These mandrels are manufactured by the inventors, H. B. Barlow & Co., Manchester, England, where we are informed they are used in several important works, amongst others at the Royal Arsenal, Woolwich. At present Mr. Barlow is in this country for the purpose of negotiating for their manufacture here. His address is post-office box 251, Lowell, Mass.




Fig. 1. Fig. 2.

Fig. 5. Fig. 4.

Fig. 3.—Expanding Mandrel.

### Effect of Case-Hardening on Iron.

Among some master mechanics and locomotive builders there exists a strong prejudice in favor of using case-hardened pins, yet pins of this kind fail oftener than any other part of a first-class locomotive. Some time ago the Baldwin people becoming convinced that case-hardened pins were unreliable, they determined to make some systematic tests to prove the matter beyond peradventure. They took a bar of 2-inch iron and cut it into lengths of 12 inches. One piece they kept out and the others they put in the case-hardening furnace. After being an hour in the furnace one piece was taken out, and another after it had been two hours in, and so on till the five pieces had gone through the case-hardening operation, the last piece taken out having been in five hours. All the pieces were then in succession subjected to a breaking strain, when it was found they had decreased in strength in proportion to the time they had been in the furnace. Examination showed that the case-hardening process did not merely affect the outside of the iron, it went to the center. In the piece that had been in longest, the heart had become crystaline, and very coarse. All the others showed similar indications in smaller degrees according to the time they had been in the furnace. In the breaking tests, the piece that had not been in the furnace doubled without breaking, but all the others snapped off.

### Fitting Locomotive Wedges.

By J. D. Campbell.

A locomotive has so many parts that bear a close relation to each other, and that are so sympathetic when one of the parts becomes disordered, that it is sometimes a difficult matter to immediately locate a complaint. One of the signs of a defect, in many of the parts, or one of the consequences of it, is a "pound," a complaint that we hear of in a locomotive about as frequently, and with the same feeling, as we do of malaria in the individual.

But we will deal now with the pounds in a locomotive, and will take the location in which we find the most and serious ones, namely, in the driving boxes and wedges, and see why they pound and what will prevent them from doing so. The cause we will find, if in the wedges, is due to a rocking of the box in them, or from causes arising from imperfect fitting when they were put up, or lined up when the engine was in the shop. This fitting of wedges on a locomotive that has done service is a matter of importance in the immediate present and future working of the parts themselves, and of other parts of the locomotive as well. On stripping a locomotive that has done much service, it will be found that the working of the wedges on the face of the pedestal has worn it hollow, or pounded furrows on it or has done both. This occurs so frequently on the "live" wedge side that it can be taken as a rule to find them so, rather than the exception, and while not so frequently on the "dead" wedge side as on the "live" one will be found there also if the wedge has not been held by a fastening to the pedestal, or securely fitted between the top of the frame and the pedestal binder brace these defects will be found on the back and the wedge also, and are produced by the same cause and same motion with those on the pedestal face, and are the most frequent causes of the driving-box pounding, or rocking in the wedges by causing the wedges to be thrown out of parallel to each other, when it becomes necessary to adjust them from time to time during the service of the locomotive.

In refitting wedges these defects should be removed; the pedestal face carefully straightened its entire length, and the wedge back filled to it. It is not only necessary that the pedestal face should be smooth, but that it should be straight its entire length. If not, when it becomes necessary to adjust the wedge, if the pedestal is high on the top end, the wedge is thrown out at the top, binding the box at that point, and allowing it to swing at the bottom.

With the pedestal face in a proper condition to avoid displacement of the wedge, when moved to different positions on it, we should consider what will be the method of lining the wedge or wedges, and what duty they have to perform. If we take the latter we will see that they have but one duty to perform, and that is to take up the lost motion between the pedestal and boxes, and that by their shape they will do it from time to time when required. But while this duty is simple, and the only one the wedges have, they should do it without affecting any of the other parts of the locomotive, and that if they will not do so it is important that they shall not only be and remain parallel to each other in their particular pedestals, but that all the wedges shall be so to each other. If the first condition is not complied with the result, as stated, will be the box swinging in the wedges. If the latter, then with the varying position of the boxes in the pedestal due to the engine settling on the springs, or to the change of position from the motion of the springs when the locomotive is running, we will have a varying distance between the centers of the wheels and length for the side rods.

Many of the complaints we hear of rods not working properly are owing to this defect in wedges not being parallel, by which their lengths are varied and a strain thrown up them that not only affects them, but causes them in turn to bind the boxes against the wedges by trying to compress or extend to a length varying as often as the motion of the springs. While the motion of the springs is not much in proportion to the length of the wedges, and the varying distance between centers of wheels is in ratio to that proportion, if the wedges are not parallel, we must remember how often it is occurring, and that no matter how slight the strain upon the rods may be, that we are putting it on a part of the locomotive that requires the minutest adjustment to enable it to do its work properly and safely.

Adams, in "Notes in Mechanical Engineering," gives the following tapers for plug cocks: Pressure up to 30 pounds, 1 to 8; pressure of 100 pounds, 1 to 12.

## LETTERS FROM PRACTICAL MEN.

### Fire-Proof Tool Rooms—Working to Gauges.

*Editor American Machinist:*

In your issue of August 2, C. E. Lipe inquires about fire-proof tool rooms. If he wants to see one (or three—one for each floor), he can do so by visiting the McKay Sewing Machine Works, Lawrence, Mass. I worked there five years ago, and as near as I remember the tool rooms were about two feet from the main building, built with a heavy brick wall with iron doors, one in the wall of each building.

In an article some time since, I referred to hardened steel gauges, instead of trying to measure thousandths. At McKay's I first saw the difference, and have since believed in that system. They had a gauge for everything, and when not in use it was kept in one of these fire-proof tool rooms.

When there was a certain piece of a machine wanted, the material to make it of, with a finished sample and the gauges, would be given to the workman, with a printed blank, on which was the order number, and rules to the effect that each workman would be required to account for each piece given him, etc.

The only tools I owned while in that shop were a hammer, wrench, two-foot rule, three-inch scale (that I once referred to as badly graduated), and a pair of three-inch calipers. I don't think I used the scale or calipers twenty times during the year. A man who has never tried it would be surprised at the time saved in setting calipers, etc., by giving his workman a gauge to work to.

If Mr. Lipe, or any one interested in machine building, and especially in planing and milling, happens to be within a hundred miles of Lawrence, it would pay to go and call on James Miles, the foreman of the planer room. I think "Jim" would give him some points that would pay for the trouble of calling on him. M. C. K.

Taunton, Mass.

### Boxing Up Fly-Wheels.

*Editor American Machinist:*

I note the American Machinist of July 26th comments on a proposed plan for preventing the liability of accident from falling into a fly-wheel by boarding up the wheel, and advises the simpler plan of fencing the wheel in. For the prevention of accident the fence, as arranged in American practice, fills the bill, and presents a much neater and more airy appearance; in fact, there seems to be something decidedly airy about a large fly-wheel. I am running a 20-foot wheel 66 turns per minute, and it makes quite a breeze, not to speak of the amount of dust it keeps in circulation, which is wearing on the engine and detrimental to the cleanliness of the engine room.

Now, the point is this: Although a wheel so boarded in would be decidedly English in its appearance, and would look like a large grindstone, still, I think, as economy is the ruling feature of the day, it would be an improvement, as it would save considerable wear on the working parts of the engine, and be easier on the coal pile, as it must take a considerable amount of power to create a breeze strong enough to blow one's hat off. J. Shand Stephens.

Windsor, Nova Scotia.

### Promoting Locomotive Firemen.

*Editor American Machinist:*

Knowing something of the difficult and hard-to-come-at business of making or hiring locomotive engineers that has been experienced by many of our master mechanics, and seeing *all* of the trouble on the side of the enginemen, of which I am one, I was very much interested in the report of the committee of the Railway Master Mechanics' Association touching this point. For some years the elevation of the standard of excellence of engineers and firemen has been a subject of considerable speculation and study on my part. There are several indispensable points of character that are needed to make a first-class engineer: first of all good judgment, cool temper, sobriety, a

natural taste for mechanical employment, sound body and mind, and a firm resolve and desire to get on in the world upon his own merits, and not through the downfall of others—for if a man seeks advancement in this way he will soon begin to plan and scheme for that downfall. Now, all who have looked into this matter acknowledge that from the ranks of the firemen come the best engineers; then in supplying the firemen should these essential qualifications be looked for, and not in the engineers.

First of all let an applicant for the position of fireman be put in the round house as a machinist helper on running repairs, where his habits, tastes and abilities can be studied by a proper person, and, if they are not *all* that could be asked in a first-class engineer, here let him stop, and do not put him on the road at all.

No examination could be devised that would always cover the case with justice or satisfaction to both sides. Let the applicant be more than 16 and less than 25 years of age; make his application in his own writing in presence of proper persons; then let him take his turn at wiping for a short time, three months for instance; he thereby learns the rules of the house, mode of keeping time, some of the duties they will be expected to perform as helper, etc.; let him act as machinist helper for from eight months to a year, and if found to still possess a liking for the business, good habits, and a willingness to learn all the details he can, at the cost of overtime, study and expense to himself, he may be set down as a willing, energetic man and one safe to trust and help, and such a man will find money to buy and time to study "Forney's Catechism of the Locomotive," and other good works on the same subject, take one or two mechanical newspapers and build himself up in knowledge of his business in spite of all opposition; and, while the company should encourage him all they can by reading rooms, etc., still there is nothing so encouraging to the right kind of a man as to know that he will be rewarded by promotion according to his merits, and not by "rights;" let him know that he must pass an examination on the locomotive ere he can run one; not a hundred scientific questions on the proper designing of valve gear and the manufacture of the engine, but a good, common sense, practical examination on the running and firing of an engine; let him know something of the common laws of combustion, let him understand in detail the working of the pumps, injectors and brakes he is to handle; let him know how to temporarily repair or disconnect a crippled engine on the road so as to get her train out of the way and the engine to the shops, promptly, right and *always*, no matter what gives out, if there is a move left in the machine. It is not absolutely necessary for an engineer to know *how* to do all the repairs on his engine, but it is necessary that he know *when* it should be done and all he can learn of the *how* will be a benefit to himself and the company that employs him. After a man has fired one year let him be examined in the rudiments of his future business, on firing, care of engine, colors, etc., (not an elaborate fineness of distinguishing shades, but let him know white, red, green, and blue apart.) Let a little more thorough examination take place every year; let them know what they are expected to learn first, and they will then learn their primer before they try the algebra; do not try to teach a green fireman indicator diagrams before he knows lead from lap, or the piston from the smoke stack. Above all in teaching firemen anything teach them the *why;* if you tell him that to properly set up wedges he should move the engine so that she will stand on top quarter, tell him why this throws the driving box against the shoe and off the wedge and leaves it free to be moved; if you tell him to always try water when he shuts off throttle when running, tell him why and he will never forget it. Issue him a time card same as engineer, and make it a rule that engineers must show firemen their running orders or read them to them; he will then, in his three or four years as fireman, become familiar with this all-important branch of the business and not have it all to worry over, half-learned, as I did, on his first trip on the right side. Engineers are very often a stumbling block to the men they should teach, and should be looked after. By this arrangement you can come near getting the right kind of stock to begin with, and by a system of practical examinations men will learn that to advance they must *know;* will not simply get on as easy as they can and wait for their rights, but try and make something of themselves, and those who don't, give you a chance to pick out the drones. Show them in practice that men so carefully trained and raised to responsible positions will not be discharged for every little offence, for they have spent years of labor at small pay, and time and study for this work; and, if all roads adopted the rule of promotion, not many good men would be forever out of a job that had cost them so much labor and expense, for a single mistake or misfortune. I believe no officer or employee of any road can look back over three years of active service, and truly say he never made a mismove that under other circumstances might not have proven disastrous. Again, this rule will in a great measure do away with the tramp engineer.

Now a word as to the examiner. I do not think any master mechanic with upwards of one thousand miles of road, has the time to look after the engineers and firemen as he should. There should be a man appointed from the ranks of engineers for this duty; not a machinist or draughtsman or an old fogy, hook-motion engineer, but a young, progressive, sober, *successful* engineer, who knows a man when he sees one, and will judge him on merits regardless of religion or political views, secret societies, nationality or mercenary motives, who will know all an engineer need know, and can travel with the men, correct wastes, encourage thrift and economy, settle their difficulties, arrange their runs, keep their personal records, hire his firemen, promote, suspend, or discharge all employees of the locomotive department. The men will respect him as one of them, whose examinations will be of knowledge gained from the same source they must gain theirs, and the result must be better engineers, faith in the public, pride in the management, and dollars in the coffers of the corporation. Such are, at least, the views of an

ENGINEER.

### Proportioning Slide Valves and Determining the Effect of Different Proportions.

*Editor American Machinist:*

It is more than probable that there is a large number of your practical readers that would like to post themselves on a ready way to determine the different points of "cut-off," "exhaust," "compression," etc., from any given slide valve, or otherwise have some ready means of proportioning a valve, so as to produce any required result. There are a variety of ways by which this can be done, and the one we use seems about as simple as any, when reduced to its most simple form. It has seemed to me that by dividing the explanation into short lessons any one who has a persistent desire to understand it can readily master so much as his practice is likely to demand that he should know.

It is assumed that those who desire to follow the subject fully understand the action of a slide valve, and the meaning of the terms "travel," "lap," "lead," etc. While this subject is usually treated as referring to the plain slide valve, the principles are the same in nearly all single valves in use, and, so far as the use of the following diagrams relate, they are applicable to all single-valve engines.

I do not claim that there will be found much in the following that is new, but shall omit giving credit to others simply because I do not know to whom the credit belongs. It only requires the most simple reasoning to understand, or it may be taken as a fact, that if a slide valve has no lap, or if the ends of the valve are just even with the outside edges of the ports when the crank is on one of the dead centers, that the engine will take steam for the full stroke, or until the crank reaches the other dead center; but if the same valve is set, so as to have some lead—that is, so the engine begins to take steam before the crank reaches the dead center—then the steam will be cut off before the piston arrives at the end of the stroke, or, in other words, if the valve has no lap the engine will make a half revolution while the valve is opening and closing the port, closing as much before the end of the stroke as it opened before its commencement.

If the valve has lap—that is, if the valve when set central projects over the ports at the ends—it is often desirable to determine at what point the cut-off will take place. This can readily be done by striking a circle equal to the travel of the valve, as shown at *A*, in Fig. 1, and through the center of this circle draw a horizontal line *B*. At *C* draw a circle with a radius equal to the lead of the valve, and in the center, at *D*, a circle with the radius equal to the lap of the valve. Now, with a straight-edge, draw the line *E*, so as to cut these two circles as shown and, where this line strikes the circle *A* at *G*, it indicates through what arc or what part of the circle the crank will travel before the cut off takes place.* That is, the engine will take steam from the time the crank is at *F* until it arrives at the point *G*.

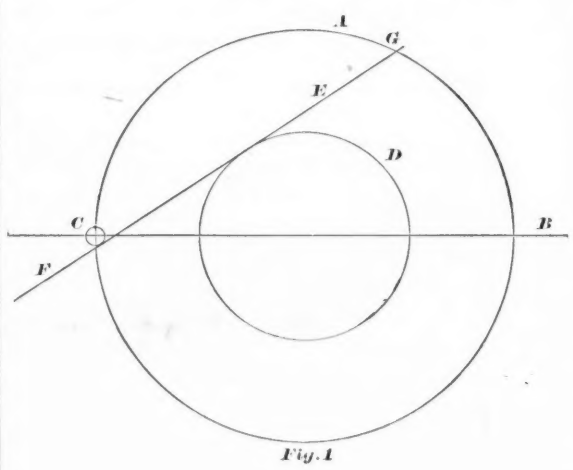


Fig. 1

To those who are familiar with the subject, this is neither new nor of any special merit; but to those who want to learn, if they will master this simple problem, and so familiarize themselves with it as to draw out the lines in different proportions, be sure and fully realize the requirements and understand the truth of the result, I will promise to make the following lessons equally simple and more interesting.

JOHN E. SWEET.

* Disregarding the inequalities occasioned by the angularity of the eccentric rod, which makes the cut-off a little earlier at one end and a little later at the other.

### A Method of Nickel Plating.

*Editor American Machinist:*

In answer to your request for a process of nickel plating on a small scale, I have used Nagel's method with great success. The process is as follows: Four parts of sulphate of nickel are dissolved in sixty parts (by weight) of pure water, and then fourteen parts (by weight) of aqua ammonia are added. When used, the bath must be heated to about 100° F. I use a common glazed earthen pot for holding the bath. Across the top of this are laid two stout, clean brass or copper wires. One of these rods is connected with the negative (or zinc) pole of a battery, and the other to the positive pole. On the former rod the objects to be plated are hung by hooks of copper wire, so as to dip into the liquid. The other rod supports a plate of battery or gas carbon, having an area about equal to that of the objects to be plated. The latter should be at a distance of about two inches from the carbon. If the object is small it may be closer, but must never touch the carbon. It must be turned from time to time in order to receive a uniform layer of nickel.

I use a zinc carbon bichromate battery of six cells, coupled in quantity, having an effective zinc surface of about seventy square inches.

The objects to be plated must be well polished, as all file marks and scratches will show after plating. The articles must also be free from dirt and grease. Just before immersing them in the bath they must be well brushed with ground pumice and water, using a stiff bristle brush. After rinsing in water they are placed in the bath. Care must be taken that there is good metallic connection between the rod and the object. The thickness of the coating depends upon the time the object is left in the bath. A good coat is obtained in about half an hour. The current must not be too strong, as the coating will then be rough and granular. After the plating, a very slight buffing will give a luster to the plating. I have plated both brass and wrought iron, and the coating shows very little wear in spite of considerable usage. I have also tried Stolba's method of plating by boiling, but the coating obtained is so thin that it wears off in a very short time.

Philadelphia, Pa. F. G. JAHN, M. E.

### A Remedy Wanted.

*Editor American Machinist:*

Is there any remedy for that *disease*, so common amongst machinists—particularly fourth-rate machinists—known as borrowing? It is provoking to have one fellow borrow a scale, another a pair of calipers, a third a hardened square, and so on until half your tools are scattered over the shop. Then when you want to use them it takes about an hour to look them up, with the probability of finding them mixed up with cold-chisels, hammers, monkey-wrenches, and the like.

I have always made a practice of getting along some way without a tool until I could afford to buy it, but there are plenty who have much more money to spend than I have, who can never afford a thirty-cent gauge—would rather borrow, you know.

I don't believe I am stingy, and have no objections to lending a tool once in a while, but you have to lend to every fellow who comes along, and go without yourself, or spend your time looking up your own tools. If you, Mr. Editor, can give us a prescription that will cure this disease you will confer a lasting favor on a large body of suffering machinists.

ONE OF THEM.

["One of Them" is evidently out of humor, as a good many have been before him. We know by actual experience just exactly how he feels in the matter, but as for furnishing a prescription, we couldn't do it any better than when we tried to study up one twenty years ago. Those persistent borrowers will always borrow just as long as anyone will lend, and good-natured workmen, like our correspondent, will always do that. Why no one would think of borrowing a carpenter's or pattern-maker's tools, and why it is considered the thing to borrow a machinist's tools, many of which are of no value only as they are known to be correct, because they have been carefully used, is one of those things "no fellow can find out." But it is a fact. We would willingly help "One of Them," because we have, in retrospect, a fellow-feeling in the matter. But we can't see how to do it.]

The locomotive recently built at the Brooks Locomotive Works having the Coventry return flue boiler, has been sent to the Chicago and North Western Railway for trial on train service. The engine was run round the yard of the Brooks Works a good deal, and, so far as could be perceived, made steam freely and worked well. The trial on actual service will demonstrate the value of the invention.

A writer in the *Fireman's Magazine* says that since the Philadelphia and Reading Railroad got control of the New Jersey Central the pay car has been chronically behind time, and the boys are having trouble to make both ends *meat*. On account of this they are scouring the streams after piscatorial prey, and the catches help to prevent the larder from getting busted.

## The Iron Trade Situation.

The steel rail mill managers have resorted to restriction in order to temporarily reduce the production of steel rails, and arrest the declining tendency in prices. A further object is sought to be reached in this policy, viz.: to draw several buyers into market who have been holding out because of the downward tendency in prices, which, in fact, has been assured by the extraordinary producing capacity. Nominally in most cases the suspensions are for repairs. In two or three cases no resumption is probable sooner than September 1. The steel rail manufacturers will not permit any further depression of prices. In fact there is no room, with Bessemer pig at $18 and $19. Of late a good many old rails have been offering on the market, but buyers have been indifferent. Foreign material is scarce, and very little Bessemer pig, speigeleisen, Scotch pig or foreign ore have been arriving. The rolling mills have nearly all resumed. In Western Pennsylvania a considerable number have gone on double. The Strickland mills are busy and bridge iron is in good request. Bar is improving, but there is still a great deal of unemployed capacity both east and west of the mountains. Iron and steel are selling very slowly in northwestern markets. Throughout the Ohio valley there is a very satisfactory degree of activity in hardware, nails, wire, and some kinds of plate iron for machine shop requirements. Prices generally are weakening, not because of a falling off in demand, but because there is so much idle or only partially employed capacity. The blast furnace interests are suffering more severely than any other, and a great deal of pig iron is selling at cost, virtually. There would be a further restriction in iron making were it not for the hope and belief that prices would be better at an early day. This hope keeps a good many furnaces in blast, and keeps brokers and agents on the street, and helps to keep buyers fearful and apprehensive. A good deal of plate and bridge iron will be wanted before November 1st. The nail makers are in hot water, and nails have been sold at $2.20 in Philadelphia and $2.10 at Pittsburgh, and even less according to some statements. Very little Southern iron is coming north. The merchants steel mills have been obliged to cut prices on several kinds of low grade. Nearly all are working, but quite a number are on less than full time. The policy of manufacturers is to work only on orders, and of consumers, to buy only as they imperatively need.

## A Substitute for a Cow-Catcher.

AN INVENTION THE EQUAL OF WOODEN NUTMEGS.

One of the wonders of the age, a new invention, is about to be patented by a Bridgeport man. It is called "the life-saving engine pilot." It is certainly a remarkable machine. By its application to locomotives the danger of run-over accidents is forever ended. The appliance is exceedingly simple, and that no man has ever thought of its practical application before, in this age of Yankee invention, is remarkable. The track-walker, man, woman, or child, is now comparatively safe as far as an express train is concerned, for by no possible chance can a locomotive under full career harm a hair of their heads.

Mr. Rosenfelt, the inventor, says that the idea of such an appliance first occurred to him by seeing the mail agents on the postal cars grab the mail bags with the appliance attached to the side of the car. He thought that if a mail bag could be caught by an iron fork and spring without damage, why could not a man be handled by making the cushions so soft that his person could not be injured? He has experimented for some time, catching chickens and dogs to begin with. He finally perfected his invention sufficiently to pick up his children without harm, and lastly, in testing his invention, it has been attached to a locomotive, and, while running at the rate of forty-five miles an hour, it has picked up Mr. Rosenfelt himself, and landed him upon the spring mattress without harm.

The life-saving pilot resembles an enormous open-work funnel. The mouth opens wide enough to cover the rails. Light steel strips converge toward the entrance of a canvas shoot. These slats are delicately balanced and backed up with a number of buoyant springs. The person to be picked up will be scooped, so to speak, into this airy funnel with such a delicate, easy motion as to prevent any concussion. The momentum of the engine will carry the man, woman, or child up over the engine through the canvas shoot, and pass him or her into a spring mattress in the first passenger car. The conductor, it is to be supposed, will collect fare, and as people will be picked up in this way between stations, they will be expected to be provided with mileage tickets. A colored porter will always be found waiting at the opening of the shoot with a whisk broom and a pitcher of ice-water.

The cow-catcher will have to go. They are of no further use. This new invention will not catch cows, as they are, as a rule, too bulky, and would clog up the shoot. It is only intended for absent-minded pedestrians.—*New Haven Register.*

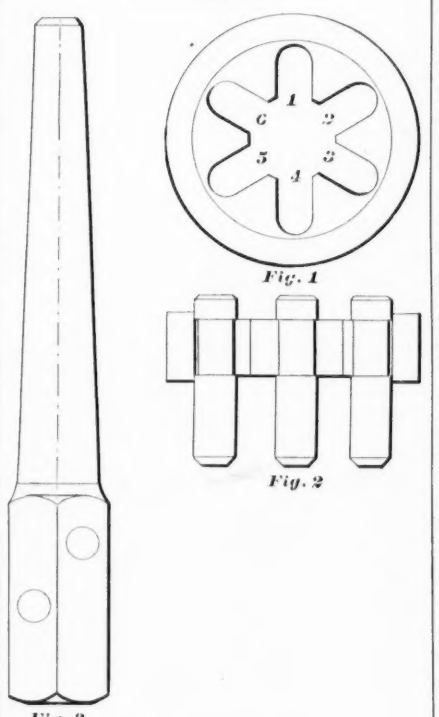


*Fig. 1*

*Fig. 2*

*Fig. 3*

## Flue Rolling Tool.

The annexed cut shows a flue rolling tool, which is used in several Western shops, and is reported to be very efficient. The rolling pressure is not so liable to crack the end of the flue as the direct pressure put on by the ordinary expander. Fig. 1 is a disk which holds the rollers, and it is shown in cross section in Fig. 2, with the rollers in place. The rollers fit into the numbered slots, and the lever, Fig. 3, which is operated to turn the rollers, is inserted in the center, after the ends of the rollers have been entered in the end of the flue.

## Best Material for Locomotive Truck and Tender Wheels.

The chairman of this committee, Mr. C. H. Cory, reports:

Out of 300 circulars sent out, I much regret to report only thirteen replies were received, and many of these contain but little information on account of having had little or no service of steel tire wheels. Out of the total thirteen reports, there are reported 1,260 steel tire wheels with various kinds of centers, and 2,000 cast spoke and plate wheels in use. These numbers include many different makes and patterns of wheels.

The opinions of the thirteen are: Nine of them prefer steel tire wheels, three prefer the chilled cast-iron wheels, and one is undecided. One member, whose preference is cast chill wheel, thinks the plate wheel better than the spoke wheel on account of being easier to keep clean and less liable to fan the dust into the working parts of the engine. He has twenty-four Allen steel tire wheels in service in engine trucks, and finds the rapid abrasure of the flange is such that they need to be turned off to obtain a better flange before the tread of the wheel required it. He thinks the cast wheel safe enough where a careful system of inspection is maintained.

One prefers a cast wheel center with Brunswick steel tire called, the Brunswick. With this wheel the tire can break in two or more pieces without leaving its place.

## General History of Stationary Steam Boilers.

BY WILLIAM LOWE.

FOURTH PAPER.

EVAPORATIVE TESTS OF BOILERS, GENERALLY CALLED COMPARATIVE TESTS.

On this there is much to be said. It would seem to be easy enough to make a test of boilers under equal conditions, but I have never seen, nor known of, one that was comparative in pro rata heating surface and duty of same. I have been censured for insisting upon equal conditions in any test of boilers that was intended to show which boiler would produce the best result from the fuel, and I will here record several so-called comparative tests which have been made within a few years, and published for the benefit of those concerned. Boilers may be tested under such conditions as they bear to each other in kind and capacity. This would be a test of conditions, and in no sense can it be called a comparative test of the economy of fuel in boilers. The first test I shall record was one of three kinds of boilers, in same mill, made, as the report stated, solely for purposes of comparison of fuels and boilers. There were six plain cylinder boilers, three feet diameter, thirty feet long, fair rating 120 horse-power; and four two-flued boilers, forty-two inches diameter, thirty feet long, with two twelve-inch flues in each, fair rating 144 horse-power; and four return tubular boilers, four feet diameter, fifteen feet long, with fifty-three three-inch tubes fifteen feet long, fair rating 225 horse-power. The duty of the cylinder boilers was 188 horse-power, fifty-six per cent. more than fair rating, and they evaporated 5.95 pounds of water per pound of coal. The duty of the flue boilers was 203 horse-power, forty-one per cent. above their fair rating, and they evaporated 7.64 of water per pound of coal. The duty of the return tubular boilers was 202 horse-power, ten per cent. below their fair rating, and they evaporated 7.74 of water per pound of coal. Comparing the evaporation, we get in the flue boilers twenty-eight per cent. more than in the cylinder boilers per pound of coal, but they did fifty-six per cent. more than their fair rating, against only forty-one per cent. more than rating of the flue boilers. The tubular boilers did thirty per cent. more evaporation per pound of coal than the cylinder boilers, but they had more than double their rating; and over the flue boilers 1.3 per cent., under a duty of ten per cent. less than rating, against a duty of forty-one per cent. more than rating in the flue boilers. These tests were of one week's duration, and under the regular duty required of the boilers. It will be seen that this is a test of conditions, and in no sense one of fuels and boilers, because neither fuel nor boilers would show their best comparative results in such a test.

The second is a test of three forty-inch diameter return tubular boilers, each containing nineteen four-inch tubes seventeen feet long, having a total heating surface of 1,284 feet, against two of the leading safety tubular boilers, each containing forty-two four-inch tubes sixteen feet long, with cylinder boilers over the tubes, total heating surface in both, 1,592 feet. In this test the power produced by the tubular boilers was 137.78, and by the safety boilers 130.41 horse-power. The evaporation per pound of combustible (allowance having been made the safety boilers of .128 to pound of combustible for wet coal) was 10.52 in the tubular boilers, and 11.25 in the safety boilers. In this test, which was made in the most scientific manner and was to be a decisive one between these two types of boilers, the safety boilers had nearly twenty-four per cent. more heating surface (which, in this kind of boiler, is said to be far more efficient than in the fire tube boilers) than the tubular boilers, and evaporated 6.9 per cent. more water per pound of combustible, under 5.6 per cent. less power, than the tubular boilers. The question in this test is: What would have been the result had there been equal amounts of heating surface and duty with both types of boilers, and what, had the conditions been reversed? This test was published in papers, magazines, and pamphlet form, to show the superiority of the safety type over the return tubular boilers.

The third is a test of return tubular boilers and combined tubular and cylinder boilers, the latter called a compound tubular boiler. In this test there were six return tubular boilers four feet diameter, fifteen feet long, each having forty-eight three-inch tubes fifteen feet long, making a total of 4,056 feet of water-heating surface and 540 feet of steam-heating surface (the last obtained by returning the heat from the tubes back over the tops of the boilers), making a total of 4,596 feet of water and steam-heating surface. The compound boilers were three, with tubular part five feet diameter, fifteen feet long, each containing 140 three-inch tubes fifteen feet long. The cylinder boiler part was thirty-four inches diameter, fifteen feet long. These three boilers have a water-heating surface of 5,850 feet, and 300 feet of steam-heating surface, making a total of both of 6,150 feet. The result of this test was an evaporation of 10.73 pounds of water to one pound of combustible in the return tubular boilers, and 11.11 in the compound boilers—a gain of 3.54 per cent. in favor of the compound boilers, they having produced 393 horse-power, and the tubular boilers 377 horse-power. But the compound boilers had 31.6 per cent. more heating surface than the tubular boilers, and, moreover, their proportion of water to steam-heating surface was twenty to one, while that of the tubular boilers was only 7.5 to one. This, it will be seen, is not a comparative test of boilers, although published to show the superiority of the compound over the tubular boilers, which had been in use many years, the compound being new.

The fourth is a test of the same safety boiler before mentioned against two flue boilers. The safety boilers have 4,576 feet of heating surface, and are rated 416 horse-power, maker's rating, which is eleven feet per horse-power. They produced 522 horse-power, and evaporated 10.90 pounds of water per pound of combustible. The flue boilers were two of forty inches diameter, 26.5 feet long, with two fourteen-inch flues and six forty-two inches diameter, twenty-eight feet long, having a total heating surface of 3,221 feet, which at ten feet, makes them 322 horse-power. These produced 741 horse-power, and evaporated 7.11 pounds of water per pound of combustible. From this it will be seen that the flue boilers evaporated thirty-five per cent. less water per pound of combustible than the safety boilers, but they did forty-one per cent. more work with forty-two per cent. less heating surface than the safety boilers. The rate of combustion in the flue boilers was twenty-two pounds of coal per foot of grate per hour, and twenty-four in the safety boilers. This test is also one of conditions, and not comparative, on duty and heating surface; yet it was published to show the superiority of the safety boilers over the flue boilers in economy of fuel.

I will give but one more test, which was made lately for a large concern, to suggest to the owners improvements in their steam plant. In this test there were sixteen 30 inch by 30 feet plain cylinder boilers, having a total heating surface of 1884.8 feet, which would be 210 horse-power at 9 feet per horse-power. These boilers produced 428 horse-power, and evaporated 8.64 pounds of water per pound of combustible. At the same time, and in the same works, there was a test of six return tubular boilers, 6 feet diameter, 15 feet long, each containing 100.3 inch

tubes, 15 feet long; total heating surface in the six boilers, 7,916 feet, which, at 14 feet per horse-power, would be nearly 565 horse-power, and it would be fair to rate them 600 horse-power. These boilers did 416 horse-power, and evaporated 13.29 pounds of water per pound of combustible. It will be seen that the cylinder boilers did more than double their fair rating, but evaporated 35 per cent. less water to combustible, and that the tubular boilers did but little over two-thirds their fair rating. The rate of combustion per foot of grate per hour in the cylinder boilers was 10.8 pounds of coal, and in tubular boilers 7.72 pounds. This is not a reliable test as to the evaporation to the fuel, because it was made by starting with good fires (which took from four to six thousand pounds of coal to make), and weighing only the coal fired upon them for ten hours, and guessing that there was as much unburnt fuel in the furnaces at the end of the test as at the beginning. I do not think any one could guess within 25 per cent. of the amount of fuel remaining upon this amount of grate at the termination of the test; and, if it was assumed that there was as much as at the beginning, there would surely be an erroneous calculation, especially as regards the amount of combustible, because that would have the benefit of all the refuse weighed back, part of which might belong to coal that was not in the furnaces, although assumed to be there, and I think the percentage of refuse was large—nearly 15 per cent.—with the tubulars having slowest rate of combustion, and over 13 per cent. with the cylinder boiler, under fastest rate of combustion. The report of this test says that the economy of the cylinder boilers is good for the class, and that no possible change could improve their economy up to a fair standard; but how any one could expect better economy from their enormous duty I cannot see. The tubular boilers evaporated only 1.57 pounds of water per foot of heating surface per hour, and the cylinder boilers 6.82. How could the result be different? It is plain to be seen that this is a test of conditions, and not a comparative test of boilers.

I could go on and describe many other tests of the several types of boilers, under varying conditions, but do not know of one that is in all respects comparative of fuel and boilers. I claim that a comparative test can only be made by each boiler or set of boilers producing its or their own draft, and evaporating the same amount of water per foot of heating surface per hour pro rata to kind of heating surface, and to secure accuracy the quality of the steam must be taken in all cases. Steam must be got up to working pressure with wood, and then new fire made with weighed wood and coal, and the test made, and at its termination the fires drawn and cooled, and refuse sifted and sorted, and the ash and clinker and fuel weighed and deducted from the total amount fired, for coal and combustible used. In this way only can boilers be tested for their comparative economy; of course the fuel and setting, as to thickness of walls, etc., must be the same, and also the time one boiler has been set and run more than another, and the condition of boiler and setting. The temperature and volume of the escaping gases should also be compared.

All but one of the above tests were made by mechanical engineers, who were supposed to be looking for accuracy, and comparisons of fuel and boilers, where not testing conditions; yet it will be seen that there was a failure in all of them to get as near comparative conditions as could be, but this may have been on account of necessities. If the temperature of the escaping gases, from one or a set of boilers being tested is higher than from another, it or they are furnishing more than their share of heat to produce the draft for all, and if such boiler or boilers are doing more work pro rata to fair rating, they must have credit for this difference, or the temperature and work reduced down to the others, to be comparative. When the results are known, under comparative conditions, they are a sure guide to the user and others, who should then consider whether the difference in space occupied and cost of the different kinds of boilers, together with the quantity of any kind of boiler he or they determine to use, will produce the power with the least cost in fuel and maintenance, for at least twenty years.

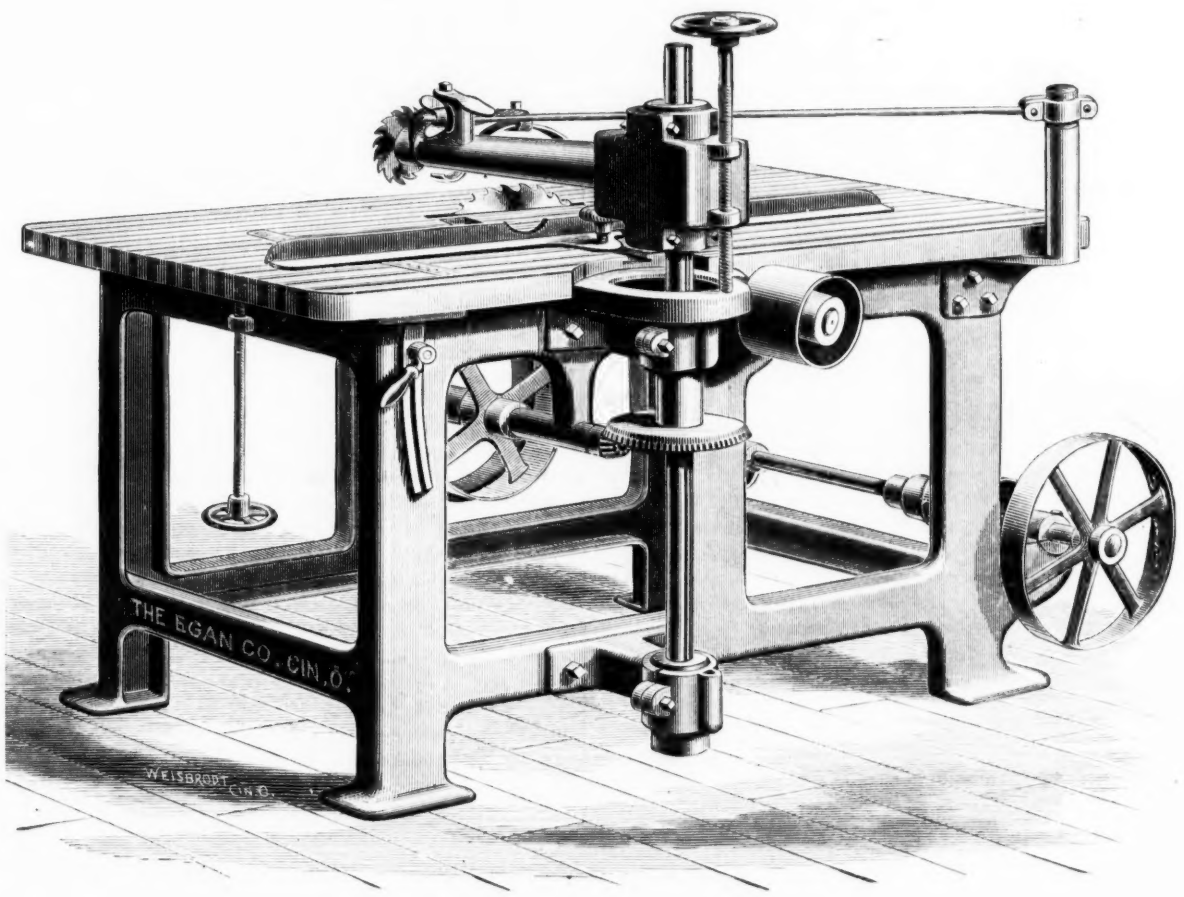
COST PER HORSE-POWER OF BOILERS.

This cost, based upon pro rata heating surface in the several kinds of boilers, depends upon the cost of that heating surface, and the labor of construction, and cost of the regular furnishings and labor thereon. It will not do to take a maker's rating without comparison of size, because one may rate a boiler 50-horse power which another rates but 40, and if the price is upon 50-horse power from each there would be a difference in price, because one gives more boiler than the other for the rating. Therefore, when asking for prices, they should be upon same size boilers to be comparative. The selling price of boilers and regular furnishings varies according to prices of stock, and labor, and the demand, the same as other things. The relative cost per horse-power of the several kinds of boilers in general use in the Eastern States, is about as follows: From 50 to 100-horse power, in cylinder boilers, $18 per horse-power; for two-flue boilers, $20; return tubular boilers, $14; and for internal-furnace boilers, in vertical tubular boilers, $14; locomotive, $22; cylindrical internal-furnace tubular boilers, $24; and in those with flues, $26; drop flue, $28; and in other kinds of similar character pro rata price, according to cost of construction, and same amount of same kind of heating surface.

The cost of the setting of these boilers, in mason work and materials, will be about as follows, in the order set down above: Plain cylinder boilers, $6.50 per horse-power; two-flue, $6; return tubular, $5 50; vertical tubular, with brick ashpits, and inclosed in brick walls, $2; and the internal-furnace boilers, locomotive, $5; cylindrical tubular, $5.50; with flues, $6; drop flue, $6. The statements and representations herein are based upon an experience of over thirty years, by the writer, who believes that they are as near the truth and facts as it is possible to get, and does not fear fair criticism based upon stated conditions.

## Improved Self-Feeding Rip Saw.

This machine, which we illustrate herewith, is one recently brought out by the Egan Company, 201 to 221 West Front street, Cincinnati, Ohio. Some of the improvements claimed for this machine are: A reliable, powerful feed, much simplified and with much less than the ordinary machinery; a method of changing from a self-feed to a hand-feed and edger in a moment by loosening one thumb screw; a way of getting at the saw without disturbing the feed-works, by simply swinging feed-arm out of the way, and a method of feeding the piece so it is always given a slight lead against the fence, and tracking the feed-saw in such a manner that the cutting blade always takes out the kerf made by the feeder.




Improved Self-Feeding Rip Saw.

The frame is cast cored, and is very strong and well braced, and stands very substantial on floor.

The feed is powerful, and consists of four speeds, 60, 80, 100, and 120 feet per minute, and it can be quickly changed from one to the other.

The table is hinged at back end, and (when feed-arm is swung back) can be raised up by the screw or clamp, or can be lifted clear up, giving free access to the mandrel and feed works.

The mandrel is of best crucible steel, running in self-oiling boxes. The pulley on mandrel is 5½ inches diameter, and 6½ inches face, and should run 3,000 to 3,500 revolutions per minute, according to size of saw used.

This machine will rip any kind of wood, either hard or soft—taking the place of the common rip saw for hand use—and the feed is so powerful that it is claimed it will do the work of from three to six men, and do it cleaner with no jerks or resting marks on the cut.

There is no danger of the operator getting his fingers cut, and no danger of the board flying back, as the boards are held firmly on each side of the cutting saw by a spring. Several saws can be used on the mandrel if necessary for sawing blind slats or work of that class.

## Electric Head-Light.

Mr. Lowry, general master mechanic of the Chicago, Milwaukee and St. Paul Railway, in reply to a letter of inquiry from us, says: We are experimenting with what is known as "Woolley's" patent electric head-light, and for your information I will add, the engine and dynamo are placed on the running board on left-hand side of the locomotive, opposite air brake pump, which is located on the right-hand side. They (engine and dynamo) occupy a space 34″ in length by 10′ in width. The dynamo is 18″ square by 10″ high. The armature is made up of disks, and is 12″ long by 6″ in diameter. The power is furnished by a small rotary engine, built by the Noteman Engine Company, of Toledo, Ohio, which runs at 600 revolutions per minute. The engine is connected to the shaft of the armature direct, the governor being on the opposite end of the shaft. There are no belts or gears of any kind. The dynamo is closed, so that it cannot be injured by the weather, etc. The lamp used is a focusing arc lamp, with an ordinary locomotive reflector. The lamp is made so that it can be regulated from the cab of the locomotive. The light is a good one; it is claimed it will penetrate so far into darkness that, should the track be obstructed from any cause, a locomotive, with the light on it, running at the rate of fifty miles per hour, an obstacle can be discovered sufficiently ahead that the locomotive can be stopped in time to avert a disaster. I might add, further, the machines are built by the "Woolley" Locomotive Electric Head-Light Company, of Indianapolis, Ind. The power of the lamp I have referred to is 2,000 candle power. It has an attachment to counteract any quick movement, so that any sudden jar of the locomotive does not affect the light in the least.

## Improvements on Nathan Injectors.

Several important improvements have recently been effected on the Nathan Manufacturing Company's injectors that will greatly reduce the work of repairs, and make the injector much more convenient to take apart. The combining tube of the "Monitor" is now attached to the line cheek; so, should anything get wrong with the tube, it can be taken out for examination by merely taking out the cheek. With this injector the lazy cock, which has been in the habit of causing trouble in cold weather through freezing, is dispensed with, and a valve operated by an eccentric stem is substituted. These improvements will also be extended to the non-lifting injectors.

Several cases have come to our notice lately where locomotives that have had the smoke box extended did not steam satisfactorily afterwards. We think that in such cases experiments should be made with the diaphragm plate to see if better regulation of the draft through the flues could not be effected. If this does not remedy the bad steaming the smoke stack should receive attention, for it sometimes happens that the stack is too wide for inducing good draft. Smoke stacks that are right for the diamond top are often too wide for the open end used with the extended smoke box.

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NEW YORK, AUGUST 16, 1884.

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## Industrial Prospects.

The industrial situation while unusually dull is not discouraging. Reductions in prices of factory, mill and farm products, as well as reductions of wages, have been going on for several months and have not yet ceased. It is expected that prices will soon be low enough to induce the investment of most idle capital in plants for productive enterprises, and in railroad extensions. Crops are generally reported good, and with an increased railroad traffic in the fall most kinds of business should improve. Railroad securities are selling very low. The decline of prices of railroad stocks and bonds is caused more by lack of public confidence in the honest financial management of the roads than by a distrust of the capabilities of roads to secure paying business. It is unfortunate that the financial management of so many railroads is under strong public suspicion while their mechanical management is good.

A conservative policy is the rule among machinery establishments. But little is being manufactured or built beyond what is already ordered. An upward turn in the market would act quickly upon prices of machinery, as there are no accumulated stocks to mention. The probability is that a few months hence it will cost from thirty to fifty per cent. more to fit up a machine shop or factory than it does at the present time. It might be profitable to build manufacturing establishments and equip them now, even if they should have to remain idle two or three years.

The development of unsettled portions of our country, especially in the Northwest and Southwest, goes on as rapidly as ever. Thus are new and permanent markets opened for the products of industry. There is every reason for confidence in the future of business.

## Locomotive Boiler Explosions.

On another page we give some particulars of two explosions to locomotive boilers that occurred within three days of each other—one of them being attended with the deplorable loss of four lives. As a class, locomotive boilers are very free from disasters of this kind, but this immunity from accident is not due to the absence of the high pressure which leads to fearfully violent explosions, for locomotive boilers carry the greatest pressure of any steam boiler in service. With this well-known high tension of steam habitually carried the factor of safety is much lower than what is permissible with any other boiler. That the public has permitted locomotive boilers to be used with what seems a dangerously small margin for safety so long is, no doubt, due to the remarkable exemption of this boiler from explosions, a run of good fortune that is attributable entirely to the intelligent supervision habitually exercised over locomotives. The growing tendency among master mechanics to raise the steam pressure of locomotive boilers still higher, at the same time increasing the size of the boilers, directly increases the danger from explosions. A boiler may be all right while it is new, and perfectly able to withstand the pressure carried, but the deterioration caused by age, defective workmanship, corrosion or accidental fracture is liable at any moment to overcome the small margin left to meet such contingencies. The practice of materially increasing the pressure for a steel boiler over what has been usual with iron sheets also intensifies the danger when the boiler gets old.

The proximate cause of the explosions referred to cannot be alluded to, and probably never will be known, for the press dispatches in both cases make the too oft-repeated announcement that the cause of the explosion is a mystery. It is well known to men connected with locomotive repair work that hundreds of old locomotive boilers are running with their stay bolts in bad condition, and it is nothing unusual, when an engine goes in for repairs, to find from ten to twenty stay bolts broken. When a fire-box in that condition goes to pieces the cause is a mystery to outsiders, but it is no surprise to those who understand the real state of the case. There is too much inclination among some men in charge of locomotive boilers to ignore the premonitions of danger indicated by broken stay bolts, leaky joints, and sheets showing incipient fracture. The locomotive boiler that exploded on the Chicago Limited Express last March showed indications of weakness in the throat sheets weeks before the explosion occurred, and the trouble was ignored, with the result that is so well known. Although two men lost their lives over this explosion, we are not aware that any blame was placed upon the man in charge of the engine who neglected the warning that the boiler was getting into a dangerous condition. Cases of that kind will not happen often before the American public will demand official supervision over locomotive boilers.

## Selling Mining Machinery by Competitive Examination.

We are not aware what mining talent there may be connected with the management of the Kerber Creek Consolidated Mining and Smelting Company, Cincinnati, O., but it strikes us forcibly that parties holding original business views control the councils of that company. The board of directors having decided to adopt the latest improvements in mining machinery, are now trying to get the selection and use of patented appliances in a way which is different from ordinary business transactions. They have issued a circular which is sent to inventors of mining machinery, telling that the company has decided to offer a premium of $500 cash for each patent which is adapted for use on its properties, and it has furthermore concluded to set apart enough of the non-assessable capital stock of the company to devote to each competitor twenty-five shares, value $10 per share, which shall be issued promptly to them upon their compliance with the requirements of the company. The expressed object in transferring these shares to them is, to reimburse them for their time and trouble, and at the same time to secure such a body of men as members who can co-operate intelligently in the management of the company. So that this benevolent scheme shall not be too one-sided, each competitor will be charged an entry fee of $15, payable in advance. In studying out the circular, we are at a loss to find who is to be the greatest gainer by this method of selling patent rights by competitive examination, itself worthy of a patent. The man who yields the right of a valuable patent for $500 does not make a fortune out of it all at once; but the man who, by exhibiting a worthless patent, gets mining stock at the par value of $2,500 in return for an expenditure of $15 does very well, unless it happens that the stock is worth exactly the scrap value of the paper it is printed on.

There is a machinist in Sing Sing prison who attempted to make use of his artisan skill to escape from that stronghold of malefactors. While working in the machine shop of the prison, he secretly designed and constructed an apparatus resembling a diver's helmet, which he intended to strap on his head, connect with its top a tin air-pipe of suitable length, then walk into the dock, and by traversing its muddy bottom wade to freedom. The tin pipe was to reach clear of the water, and by that means was to supply the inventor with air. The scheme was almost worthy of some of Dumas' heroes, and it seems to have been a loss to the cause of blood-and-thunder literature that the machinist did not have the opportunity to try his invention. The only trouble with ingenious men of that stamp is, that their inventive faculties can be used too effectively in opening safes and other safeguards of property. We think the machine shop of Sing Sing must be run on a loose system when a convict was able to proceed so far with his invention as this man did before the job he had on hand was recognized.

## Literary Notes.

A TREATISE ON TOOTHED GEARING. CONTAINING complete instruction for designing, drawing, and constructing Spur Wheels, Bevel Wheels, Lantern Gear, Screw Gear, Worms, etc., and the proper formation of Tooth Profiles. For the use of machinists, pattern makers, draughtsmen, designers, scientific schools, etc. By J. Howard Cromwell, P.H.B. New York: John Wiley & Sons. Price $2.

The author, in this work, has presented in a concise form such information as those interested in designing and constructing gearing should have at hand. Commencing with first principles, he continues with the proper form of tooth profiles for the various kinds of gearing in use; the advantages and disadvantages of different forms of teeth; conditions for uniform velocity and minimum friction; practical methods for laying out teeth of all kinds of gearing; strength of teeth, arms, and the various parts of wheel gearing, with rules and formulas for determining dimensions. Complete designs and full working drawings are given, etc., etc. Tables for determining the diameters of steel and iron shafts are also given. The author has adopted the plan of giving solutions in all cases both by formulas and by plain arithmetical rules, which is in every way commendable, and cannot fail to popularize the work. Concerning this, we cannot do better than quote from his preface. He says: "He who possesses the requisite knowledge of algebra and geometry—for which any man will be better off—may make use of the formulas in designing the gears he may have to construct; while he whose knowledge of mathematics goes not beyond the simple rules of arithmetic may obtain precisely the same results, and do in every way as good work, by using the corresponding rules."

We believe Mr. Cromwell has accomplished good work in bringing together in this volume a great deal of information, only to be found by searching many works, and by adding the results of his own experience in the field of mechanical engineering.

A TREATISE ON PRACTICAL AND THEORETICAL MINE VENTILATION. By Eugene B. Wilson, Instructor in Drifton Industrial School for Miners and Mechanics. New York: John Wiley & Sons, 15 Astor Place. Price, $1.25.

In this book the author deals with the subject of mine ventilation much more plainly than is ordinarily done, his object being to impart information for those who work in mines. To this end intricate formulas, useful only to the accomplished engineer, are avoided, and the plainest practicable solution of problems given. Many lamentable accidents in mines are due to lack of information on the part of miners, and one of the avowed objects of this work is to assist in supplying this information in a simple and comprehensible form.

WORKSHOP RECEIPTS. By C. G. Warnford Lock. E. and F. N. Spon, 35 Murray Street, New York. Price, $2.

This book is the third in a series published by Messrs. Spon for the purpose of supplying the growing demand for technical knowledge applicable to ordinary workshop operations. The varied assortment of information contained in this volume is presented in an interesting and attractive form, the best authorities on the various subjects being drawn upon. This number is principally devoted to metallurgical subjects, the most improved methods of treating leading metals and alloys being given in a succinct form. Most mechanics will find the part on alloys very interesting and instructive reading, and it contains nothing beyond ordinary comprehension. The same may be said of the articles on iron and steel. From among the other portions of the book we would claim special attention for the "electrics" section; also the part treating on lubricants. "Workshop Receipts" seems a very unpretentious name to a book which contains a storehouse of technical knowledge respecting a multitude of mechanical and manufacturing processes.

H. P. Hubbard, New Haven, Conn., has issued vol. 3 of his Newspaper and Bank Directory of the World. It purports to

contain the names of nearly sixteen thousand newspapers in the United States and Canada, which is claimed to be "fifteen per cent. more than in any other directory." In looking over the list we notice the names of several that have gone where the "woodbine twineth," while the names are omitted of several that are alive and kicking. Comparatively few of the statements of circulation are sworn to by the publishers. A great many large circulations are "claimed," and still others are "estimated," the conscience of the publishers apparently not permitting them to make affidavit to the figures they wish the public to accept as the true measure of their circulation. The directory describes each paper even to the width of column. Lists of foreign papers of special classes are given.

## QUESTIONS AND ANSWERS.

*Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.*

*Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials, nor location will be published.*

(312) **I. P., Fall River, Mass., asks:** Will you tell me the easiest method of making conical springs, such as used on the valves of the Dean steam pump? *A.*—Such springs can be very conveniently made by turning a conical mandrel and cutting a groove with a half-round tool, a little larger than the diameter of wire, gearing up the lathe as for cutting a screw, making the pitch whatever you require for the spring. Then wind the spring the same as you would wind any spring in the lathe. There may be a better way than this.

(313) **A. W., Providence, R. I., writes:** 1. I have a rule that says the area of opening between bridge wall and boiler should be 3-20 of grate surface. Is this right? *A.*—Our preference would be for 3½-20 to 4-20. 2. In your answer to Question 300, I suppose you mean by "opening over bridge" the area of opening between bridge wall and boiler, and by "openings through tubes" the combined area of all the opening through tubes. Am I right? *A.*—Yes. 3. In using packing with rubber in it, will it injure the piston-rod when it comes in contact with it? *A.*—We have made a good deal of use of packing of this kind and never experienced any trouble of the kind referred to.

(314) **J. J. M., Elkhart, Ind., asks:** Suppose upon a well-dressed bed plate we place two cast-iron bodies, one being a cube containing 125 cubic feet and the other a parallelogram 25 feet long, 5 feet wide, and 1 foot thick, containing also 125 cubic feet, both bodies being of the same weight. To move each of these bodies along the plate, to which must we apply the most force? *A.*—The second law of friction is: *The measure of friction is independent of the extent of surface, the pressure and the condition and character of the surfaces remaining the same.* According to this it would require equal force to move the bodies, unless the pressure on the smaller surface was so great as to disturb some of the conditions.

(315) **L. M. W., Newark, N. J., writes:** I am pumping water from a driven well. The pump is 25 feet below the surface and the tank into which I pump is 65 feet above the surface. Will you suggest some simple method by which I can tell when the tank is three-quarters full, or when the water is at any height in it? There is a float valve for preventing overflow. A pressure gauge will not work satisfactorily for the purpose. *A.*—We do not understand enough about the relative location of pump and tank to detail a plan. It is probable, however, that you might use a float in the tank and connect a cord—preferably a small wire cord to the float, and by means of small grooved wheels bring the end of the cord down to the pump-room, then by means of a "tell-tale" on the end of the cord you could tell the height of water in the tank. If you cannot do this, you can lead a small pipe from the tank to the pump-room that will overflow when the tank is, say three-quarters full. Another plan is that of an electric indicator, which you will find illustrated in the AMERICAN MACHINIST of January 14, 1882.

(316) **W. L. R., Tallahassee, Fla., writes:** I have an 8½-horse power upright boiler, with engine attached, which I use for running a grist mill and cotton gin. I have trouble in keeping up steam when pumping water into the boiler. The steam goes down, and we have to stop and wait for it to come up. There is no heater, cold water being pumped directly into the boiler. Can I better myself by using a Hancock inspirator? The water tank is a little higher than the boiler. Suppose I run a pipe from tank through ash-pit and to the inspirator, or would it interfere with the working of the inspirator? *A.*—As between feeding cold water with the pump and feeding with the inspirator, there would be a little gain by the use of the inspirator. We should not advise running the pipe through the ash-pit, as it would be likely to interfere with starting the inspirator, and, when working, the gain would not be of any consequence. It would be advisable to use a heater; then you can use either pump or inspirator. Whatever you feed with, you should arrange the feed as nearly constant as is practicable. We presume you exhaust through a nozzle into smoke-stack. If not, you can increase the capacity of boiler by doing so.

(317) **A. M., ——, writes:** I come to you for information about bad draft. We have two boilers, 54"x16 ft., each with 39 tubes 3¼" diameter; grate surface for each boiler 5 ft. x5 ft. There are two bridge walls to each boiler, the back one two feet forward of back flue sheet; depression between bridge walls about 30"; space between back end of boiler and back wall two feet. The bridge walls are straight across, 7" from boiler. Ashes accumulate on the top of back wall. There are two dampers, one over each smoke-box, each having an area of 4⅔ feet. The flue leading from boiler nearest stack is straight; the one leading from the other boiler has an offset, the two flues passing along, side by side, to the wall of building, when both come into one flue, 36" diameter, 10 feet long, leading to smoke-stack. The smoke-stack is 70 feet high, 4 feet square inside. Near the bottom of stack, and on the side opposite boiler flue, is a 14" flue from kitchen range, which turns up about 6 feet. There is a good draft at smoke-boxes, drawing in a light as into vacuum. What do you think the trouble is? *A.*—There is sometimes trouble with draft from the flues of two boilers coming together in such a way that one interferes with the other. They should always be arranged so that the gases from each can start in the large flue, into which they merge quite independently. In the instance of another opening into the chimney, as in that of the kitchen flue, it is better to make a partition below and against the entrance of the upper flue and extending up three or four feet, so that the lower flue shall not interfere with the draft of the upper one. If the extension of 6 feet referred to is above the entrance of boiler flue, this of course may not be necessary. It seems, however, from your last statement, that there is no trouble with chimney draft. The trouble is probably altogether owing to an insufficiency of opening through tubes. The total amount of this opening is less than 2 feet, or about right for a grate surface of 15 feet. If the tubes were not so long by 4 feet they would be better, especially for the height of chimney; or if the chimney were 50 feet higher the draft would be materially improved. As it now is, we should brick up at least five square feet of the grate surface, being careful to make it tight against the entrance of air. This will also make the proportion between grate and heating surface better than at present. It will not, in all probability, be possible, with the small area of tube openings, to get the results due to heating surface, but you can probably improve the fire.

## BUSINESS SPECIALS

*Transient Advertisements, 50 cts. a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.*


Mackenzie Cupolas and Blowers, 245 Broadway, N.Y.

Presses & Dies, Ferracute Mach. Co., Bridgeton, N. J.

Steel Name Stamps, &c. J. B. Roney, Lynn, Mass.

Rotary Files, Tower M. Works, E. Brookfield, Mass.

"How to Keep Boilers Clean." A book mailed free, by James E. Hotchkiss, 86 John street, N. Y.

Fine tools and special machinery. Horace Thurston, 84 Clifford street, Providence, R. I.

Herbert W. T. Jenner, Mechanical Engineer and Solicitor of Patents, 632 F st., Washington, D. C.

Lyman's Gear Chart. How to lay out gear teeth. Price 50 cents. E. Lyman, C. E., New Haven, Conn.

Foot Power Machinery, for workshop use, sent on trial if desired. W.F. & John Barnes, Rockford, Ill.

The latest Improved Tack and Match Machinery is made by White Machine Co., Waterbury, Conn.

Pattern and Brand Letters. Vanderburgh, Wells & Co., corner Fulton and Dutch streets, New York.

Universal grinders for lathe-centers, chucks, angles, or cylinders. C. C. Hill, 84 Market st., Chicago, Ill.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

National and box chucks, foot and power lathes, and slide rests. Lodge, Barker & Co., Cincinnati, O.

DRAWINGS—Mechanical, electrical and Patent Office. All styles of artistic designing. Special facilities. Low rates. Wallace Metcalf, 140 Nassau St., N.Y.

Guild & Garrison's Steam Pump Works, Brooklyn, N. Y. Steam Pumping Machinery of every description. Send for catalogue.

Improved Tack Machinery, made by The Willets Man'f'g Co., can be seen in operation at their works, 57 Clifford St., Providence, R. I.

The "Wax Process" Engravings shown in the AMERICAN MACHINIST each week are made by Struthers, Servoss & Co., 32 Frankfort Street, N. Y.

Engine Lathes, Hand Lathes, and other fine tools. Assortment large: prices low. Frasse & Co., 62 Chatham St., N. Y.

The Complete Practical Machinist, $2 50; the Pattern Maker's Assistant, $2.50; Mechanical Drawing Self-taught, $4 00; books for practical machinists. Address, Joshua Rose, Box 3,306, New York City.

EXTRACTS FROM CHORDAL'S LETTERS, 400 pages, 12mo., handsomely bound in cloth. New and enlarged edition, with over 50 illustrations. Price $2. Published by John Wiley & Sons, 15 Astor place, New York.

For a strictly first-class automatic engine, from 10 to 60-horse power, apply to the Straight-Line Engine Company, Syracuse, N. Y.; medium or high-speed; perfect balance; fewest parts and fewest working joints; uniform speed at all ranges of power or steam pressure; the best material and workmanship in all vital parts; the most correct distribution of iron; unexcelled in smooth running.


## MANUFACTURES.

Denison, Texas, wants a cotton factory.

R. D. Cole & Co. are erecting a cotton-seed oil mill at Newman, Ga.

There is some prospect of railroad shops being located in Lake City, Fla.

The Baltimore and Ohio Railroad will build a round-house and repair shops at Harrisonburg, Va.

Carpenter & Sons, Lincolnton, N. C., will enlarge their cotton mill and nearly double their machinery.

The Mountain Mills Company (cotton factory), Barton, Ala., expect to add $20,000 worth of new machinery.

The new car-wheel foundry being erected by the Raleigh and Gaston Railroad, at Raleigh, N. C., is nearly completed.

McNab & Harlin Manufacturing Company, Paterson, N. J., are preparing to put a new engine and boiler into their works.

Garrepy & Co., Fort Worth, Texas, will build a foundry, boiler works, etc., at Temple, Texas. The site has been located.

The Eureka Bolt works has been fully organized, at Alexandria, Va., and will proceed to erect a factory. The capital is $300,000.

Obert & Grove is a new firm, just completing boiler shops, at Lebanon, Pa. A large force of workmen will be employed.

The Lechner Manufacturing Company (machinery manufacturers), Columbus, O., are increasing their facilities and enlarging their capacity.

The Knoxville (Tenn.) Woolen Mills Company, previously reported, have commenced work on the foundation of their extensive building.

Efforts are being made to establish a cotton factory in Pine Bluff, Ark. F. G. Smart is soliciting subscriptions, and will give particulars.

Edwards & Co., electricians, 144th street, near McComb's Dam, New York City, will erect a two-story factory, 68½x19 and 30 feet, on 146th street.

A four-story factory, 50x70 feet, to cost $8,400, will be erected at 20 and 22 Bergen street, Brooklyn, N. Y., for the estate of D. K. Ducker, Fulton street.

A. H. Crandall, proprietor of the Valley Machine Works, Valley Falls, Kansas, is erecting a new machine shop, 42x50 feet, including blacksmith and wagon shop.

The new Baragwanath Feed-Water Works are being erected in Chicago and will be ready for operation this fall. The building is 75x150 feet, two stories high. New machinery will be added.

The Western Engine Works, of Marshalltown, Ia., write us: Business good, and improving. Running on full time in new factory, 30x70 feet, two stories, with a wing 18x46 feet, and a coal house 10x48 feet.

William Baragwanath has recently sent two large heaters to Philadelphia. He reports business so good that he is working a full force of men in his shop, and is able to dispose of all the work they turn out.

P. W. Shaefer, of Pottsville, Pa., has purchased 100,000 acres of timber land in Sullivan and Johnson counties, Tenn., and it is reported will erect a large factory at Union Depot, Tenn.—*Baltimore Manufacturers' Record.*

The Blevney Manufacturing Company, of 56 Academy street, Newark, N. J., have purchased land in East Newark, and will at once erect a shop for the manufacture of Blevney's friction clutches, pulleys, and couplings.

A recent dispatch from Waco, Texas, says: Superintendent H. M. Hoxie, of the Missouri Pacific, is expected here to-morrow, and a delegation of citizens will meet him to induce him to locate the machine shops at this place.

J. S. Corbin, general superintendent of the St. Lawrence Manufacturing Company, manufacturers of agricultural implements, at Gouverneur, N. Y., has decided to sell out his interest in that establishment, intending to go South and engage in the same business.

A correspondent writes us as follows, from Marinette, Wis.: Business here, at Marinette Iron Works, is good. The shops are running night and day, on orders for saw-mill work, crowded to their fullest capacity. New additions have lately been made. Mr. J. C. Kirby took the position of superintendent the 1st of June, coming from Clinton, Ia.

Whiting Brothers, Cedar Rapids, Iowa, are making a small automatic cut-off engine, with piston valves, the steam chest being cast along with the cylinder. They have got up some special tools for doing the work on the engine, and the superintendent of the works thinks they can make the engines cheaper than the ordinary slide-valve engine, as got out in neighboring towns.

The Cummer Engine Company, of Cleveland, O., one week, recently, shipped engines to the following parties: One of 55-horse power, with complete outfit, to Goshen (Ind.) Electric Light Company; one of 130-horse power to C. B. & D. H. Gowen, Canal Winchester, O.; one of 55-horse power to A. Dietly & Son, Moorheadville, Pa.; one of 250-horse power to J. P. Evans & Co., Indianapolis, Ind. Their engine of 250-horse power, recently started in the Amoskeag Cotton Mills, Manchester, N. H., gives good satisfaction. The company has recently started their ice and refrigerating machines in three large breweries. They report a very flattering outlook for their business.

The Straight-Line Engine Company, Syracuse, N. Y. (Prof. John E. Sweet, president), have just issued a new finely-illustrated and well-printed catalogue. It describes the engines in detail and gives a somewhat extended account of the materials, methods, and tools used in their construction. The object of this is to show the unusual care bestowed upon all the minor parts. Engines are built up to 100-horse power. The preface says: "The engines are all set upon a solid, level, cast-iron plate in the shop, run to speed, tested, indicated, and balanced, until they stand perfectly still, without being fastened in any way whatever." The company has recently built a special electric-light engine, called "Jumbo," for Edison's Electric Lighting Company, which is now running at their shops, in New York City. Mr. Edison says the engine works well, and is taking steps towards negotiating to build Straight-Line engines in his own shops.

An Angelica, N. Y., correspondent writes us: The Angelica Foundry and Machine Company have their foundry about ready to begin operations. This company is driven with work; have rebuilt several locomotives and have a contract for the repairing of cars for the Globe line freight, which line is running a large number of heavy trains through this place daily. The machine shops of above company are to be enlarged at once, and the wood, pattern, and paint shops built at once. The force is being increased as fast as they can find room for new workmen. Messrs. Galusha Brothers have their new planing mills running, and appear to be doing a good business. Messrs. Brown & Lockhart, manufacturers of manilla wrapping paper, who filled last season, with satisfaction, an order from the Treasury Department, Washington, have just received another order, amounting to $15,000.

William Munzer has recently moved his machine shop to new quarters, at 204 Forty-third street, New York, where he has now got a finely-arranged shop. Although not rushed with business, he has got two of his improved Corliss engines on the floor of the erecting shop, one of them having a cylinder 14x30 and the other 18x42 inches. He lately delivered a Corliss engine 16x36 to the New Haven Manufacturing Company, who are highly pleased with it and report that it uses one-third less fuel while doing the same work as the old one. Round the shop, Mr. Munzer has many of his small upright slide valve engines in various stages of construction. These engines, and all his other staple work, have the parts made interchangeable and after standard gauges. He is an enthusiastic advocate of standard gauges and first-class machine tools. All the tools in the shop are of the newest designs made by the best makers. On a question being asked about the relative cost of machine work and hand work, he said, "I have tried all ways of running a machine shop, and I find that the cheapest way to get out work is to use the best tools made, and keep them in good order; then, when I tell a man to do a job, I expect it to be done in first-class style, or I know who to blame. When I have a poor tool in the shop, however, and a man turns out a bad job of work from it, I cannot say a word of reproof, for he is ready to retort, 'Well, look at the tool I have got to work with,' and the reproach comes back to myself." They are building a fine steam windlass in this shop for Mr. Astor's yacht. All the fittings and castings are galvanized, to prevent corrosion by the sea water.

Robert E. Masters, Columbus, Ga., writes us Thursday, 24th ult., Captain S. J. Whiteside, president of the Central Cotton-Press Association, of Georgia, drove to the office of the Columbus Iron Works Company, and invited your correspondent to ride out and see the first bale of cotton pressed in the compress erected here by Central Railroad and Banking Company of Georgia, under the supervision of Captain Whiteside. The platform used by the compress is 450 feet long and 250 feet wide. On the east and west sides of the platform are store-rooms, each 400 feet long and 70 feet wide, one for receiving cotton, to be pressed the other for storing compressed cotton. In the center of the platform there is a building 92 feet square and 50 feet high, in which is erected one Morse cotton compress, patented by S. B. Steers & Co, New Orleans, La., and built by the Scott Foundry, of Reading, Pa. The following are the dimensions and weight of the principal parts of the press: Cylinder 90" diameter, 8 feet stroke, weight 15 tons. The lower platen is cast iron, weight 92 tons. There are 4 lifting rods of wrought iron, 12" diameter, 19 feet long, which weigh 6 tons each. The bed plate weighs 30 tons, and the secters, of which there are two, weigh 9 tons each. Height of press is 32 feet, and the entire weight is 380,000 lbs. It is worked under a steam pressure of 120 lbs., and exerts a pressure on each bale of 1,800 tons; average size of bale before pressure is 5' 4" long, 2' 6" wide, and 4 feet in depth, weighing 18 lbs. to the cubic foot. In the jaws of the press the size is reduced to 8' in depth, the length and width receiving the same reduction, and weighs about 70 lbs. to the cubic foot. South of the press-room is a fire-proof boiler house, 24 feet wide, 44 feet long, and 20 feet high. The boilers, of which there are two, are 50 inches in diameter and 22 feet long, and have 14 six-inch flues in each. There are two steam drums 36" diameter, and 14 ft. long. Boilers were built by Portsmouth (O.) Foundry and Machine works. There are three tracks on the east and three on the west sides of the platform, each of which will hold a train of fifteen cars, and they have arrangements to load and unload all without moving a train. The tracks connect with Southwestern Railroad, of Georgia, a branch of Georgia Central Railroad. The cost of entire outfit was $70,000, and as the press has a capacity of 600 bales per ten hours' run, the merchants here do not now fear a cotton blockade.

Gould & Eberhardt, of Newark, N. J., have recently shipped the Eberhardt Universal Automatic Gear Cutter to Fay & Scott, Dexter, Me.: Mason Locomotive Works, Taunton, Mass.; Standard Machinery Company, Mystic, Conn.; Ball Brothers, Madison, Wis.; Robert Tarrant, Chicago, Ill; and are building some for Scott's Printing Press Works, Plainfield, N. J., and some on foreign orders. Some had the automatic rack cutting attachment; a very useful addition.

## Machinists' Supplies and Iron.

NEW YORK, July 31, 1884.

There has been no notable change in the condition of the supply business since last week. There prevails a hopeful spirit of improvement, in business coming round directly, but it is difficult to perceive any change for the better so far. A leading dealer seemed to strike the key-note of the situation when he said that he could make sales if he would dispose of his goods without profit, but he had not come to that yet. Buyers appear to be in a more favored position than sellers.

Steam supplies continue in fair demand and a healthful feeling pervades the trade.

Boiler-makers supplies are decidedly depressed. Nominal prices are:

| | |
|---|---|
| Boiler Plate—Common | 2 4-10c. |
| Refined | 2 6-10c. |
| Flange | 4 1-10c |
| Extra Flange | 5¼c. |
| Chester Steel | 5¼c. |

Iron—American pig continues dull, with no prospect of immediate improvement. The demand continues confined to the narrow proportions reported from week to week, which shows consumers determined to limit purchases by the daily wants of their trade. The offerings are in excess of the demand, with the effect of shading down prices, although not to any great extent. The standard brands of No. 1 X Foundry are still quoted $20, to $20.50 at tide-water, but other makes are offered at lower prices, and these prices are not much more than nominal quotations. No. 2 X Foundry, $18 to $19; Grey Forge, $16 to $17.

Scotch pig has been in moderate demand. Shotts, $21.50 to $21.75, to arrive; Coltness, $21.50 to arrive, $22 yard; Glengarnock, $20 50 to arrive, $21.50 yard; Summerlee, $20 50; Langloan, $21; Dalmellington, $19.50.

Antimony—There has been no quotable change in the value of regulus. The demand is moderate and barely steady. Hallett's, 10¼c.; Cookson's, 10¾c.

Copper—The demand for ingot continues light and the market is dull. Lake, 13¾c. to 14c.; other brands, 13c. to 13½c.

Lead has ruled slightly firmer, for small lots of common pig, but the general demand rules light. Prices are from 3.60c. to 3.62½c.

Spelter is not much in demand. Western is quoted at 4.50c.; Silesian dull and nominal; common domestic 4.50c. to 4.70c.

Tin has ruled quiet and a trifle irregular. We quote, for jobbing lots, Banca, 20¾c.; Straits and Malacca, 18.80c. to 18.95c.

## ✻WANTED✻

*"Situation and Help" Advertisements, 30 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday morning for the ensuing week's issue.*

Wanted—An engagement, by mechanical engineer and draughtsman. Ten years' experience. Best references given. Address S. R., care AM. MACH'ST.

Wanted—A permanent situation, by a competent draughtsman, on locomotive, engine, boiler, or general machine work. Address E. Y., Box 5, AM. MACH.

Wanted—Foreman for a boiler shop, in a Western city; must understand laying out all kinds of boiler and sheet iron work. References must accompany application. Address D., care AM. MACHINIST.

A competent and experienced superintendent or foreman desires engagement; used to handling men and the designing of machinery. Best of references from standard firms. Address Box 7, AM. MACHINIST.

First-class mechanical engineer and draughtsman, with extensive experience as designer, superintendent, and salesman, is open to an engagement. Steam engineering a specialty. Best of references. Address "M, 100," AM. MACHINIST.

Wanted—An energetic foreman, for our foundry. Must be well up in railroad, machine, and house castings. Only sober, reliable, and intelligent men need apply—stating age, price, and qualifications—with references, to Marshall Car-Wheel and Foundry Company, Marshall, Texas.

For Sale—Two large compound hoisting machines, suitable for quarry work, inclined planes, or other purposes where heavy hoisting is required. Will be sold cheap, as the space occupied is required for use. Can be seen at 414 Water street, N. York City.

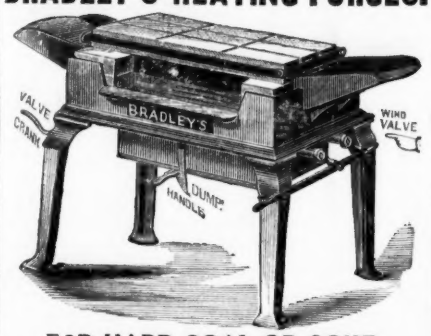
Wanted—Parties traveling and selling to steam users, or dealing in mill supplies, to take the agency of a good and fast-selling article. Good inducements offered. Address "Manufacturer," care of AM. MACHINIST.

Wanted—Iron planer, about 40"x40"x 10 ft.; also boring and turning mill, about 8 ft diam. and two heads, second-hand, but must positively be in first-class condition. Address, giving fullest particulars of tools, with maker's name, lowest price, and where can be seen, W., care AM. MACHINIST.

Wanted—Purchaser for my ¼ interest in agricultural implement works; capital $60,000. Large and paying business, established and fully protected by patents; buildings and machinery new and first-class. Paid one dividend. A grand chance. My position, as superintendent and director (salaried), goes with the sale. Reason—want to go South and start same manufacture. Will also sell my residence, worth $10,000, at a sacrifice. Address J. S. Corbin, Gouverneur, N. Y.


**HILL, CLARKE & CO.,**
36 OLIVER ST., BOSTON, MASS.,
Branch Office and Storehouse,
800 N. 2nd ST., ST. LOUIS, MO.
**ENGINES and BOILERS,**
MACHINE
**TOOLS & SUPPLIES.**
Send for Special Catalogues.
Correspondence Solicited.

**BRADLEY'S HEATING FORGES.**



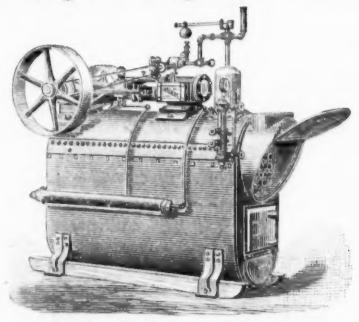

FOR HARD COAL OR COKE.
INDISPENSABLE IN ALL SHOPS to keep **Bradley's Cushioned Hammers** and men fully employed, and reduce cost of production.
**BRADLEY & CO., Syracuse, N. Y.**
(ESTABLISHED 1832.)

**THE SEIBERT CYLINDER OIL CUP CO.**
Manufacturers of Oil Cups for Locomotive, Marine and Stationary Engine Cylinders, under the Seibert and Gates Patents with Sight Feed.

TAKE NOTICE.
The Sight Feed is owned exclusively by this company. See Judge Lowell's decision in the United States Circuit Court, District of Massachusetts, Feb. 23, 1882. All parties, except those duly licensed by us, are hereby notified to desist the use, manufacture or sale of Infringing Cups, as we shall vigorously pursue all infringers.
THE SEIBERT CYLINDER OIL CUP CO.,
*New York Office, 26 Vesey St. 53 Oliver St., Boston, Mass*

**TABLES OF SPEEDS.**
Tables of the principal speeds occurring in mechanical engineering, expressed in mètres in a second. By P. Keerayeff. Translated by Serglus Kern. Price, 20 cents. Descriptive catalogue of books, 100 pages, free.
**E. & F. N. SPON, 35 Murray Street, N. Y.**

**The Sedgwick M'f'g Co.,** POUGHKEEPSIE, —N. Y.—



SEND FOR CIRCULARS.

This space is engaged by
**THE BLEVNEY MANUF'G CO.,**
*56 Academy St., Newark, N. J.,*
to bring to the attention of PRACTICAL MECHANICS
BLEVNEY'S PATENT
**PULLEYS, CLUTCHES and COUPLINGS**
SEND FOR CATALOGUE.

**The Deane Steam Pump Co.,** HOLYOKE, MASS.
NEW YORK. BOSTON. PHILADELPHIA. CHICAGO. ST. LOUIS.
MANUFACTURE
**PUMPING MACHINERY**
FOR ALL DUTIES.
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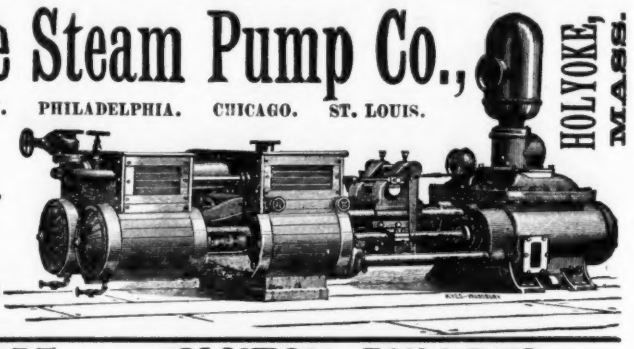

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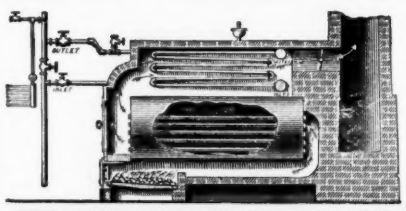


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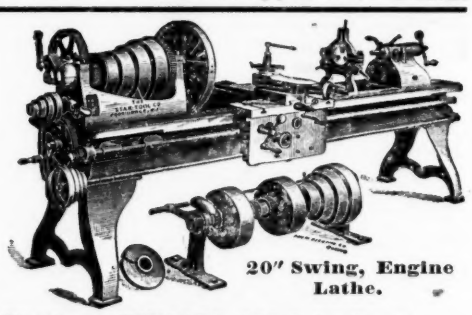

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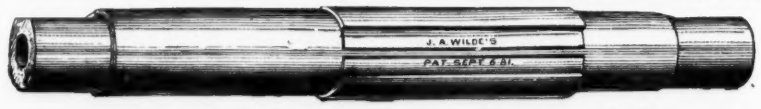


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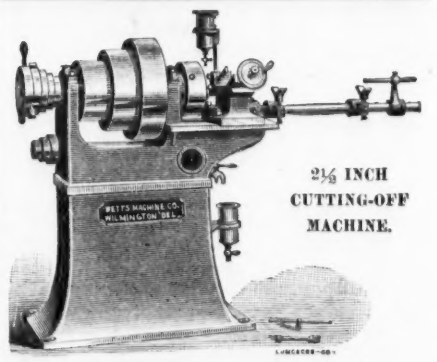


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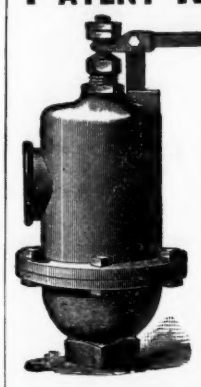

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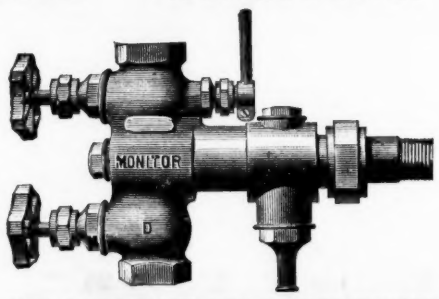


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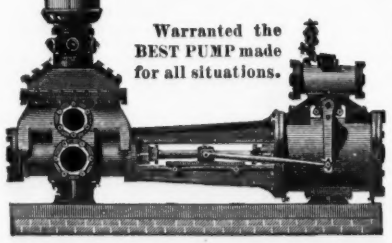

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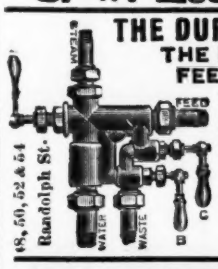


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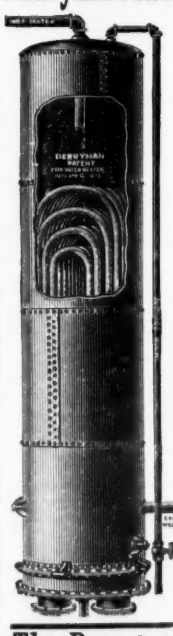

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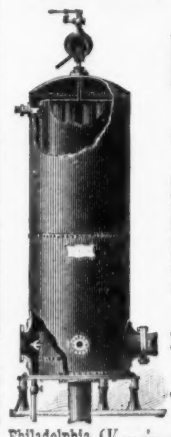

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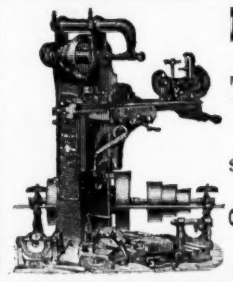

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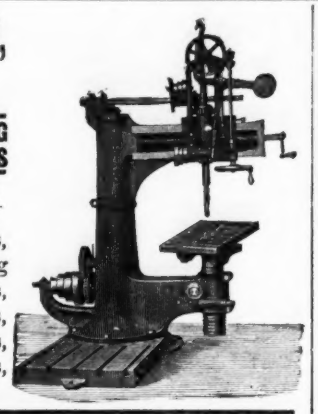

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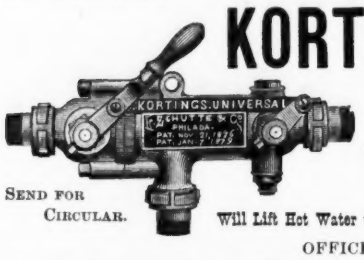


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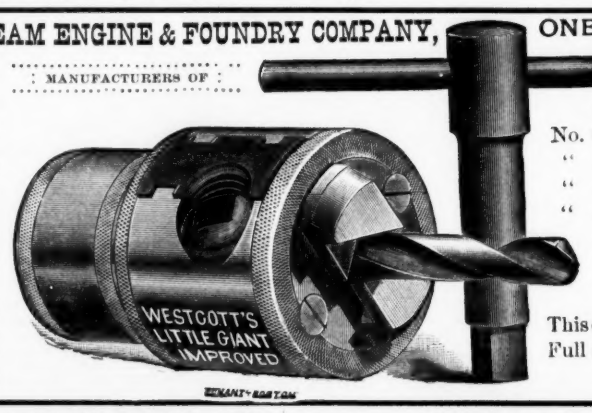


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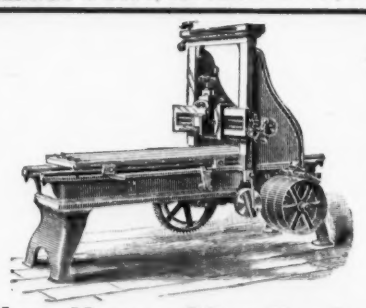

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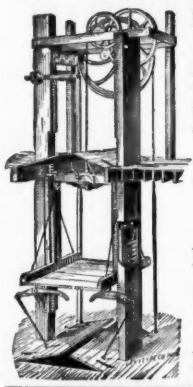

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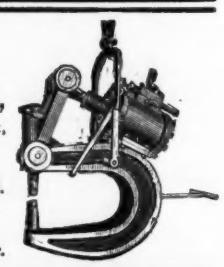

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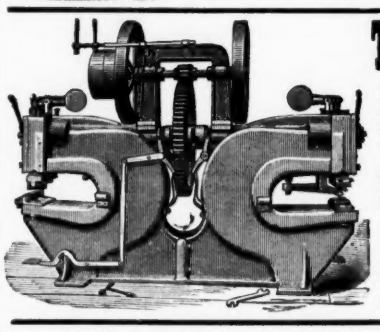

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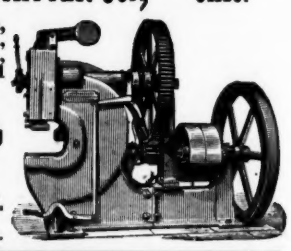

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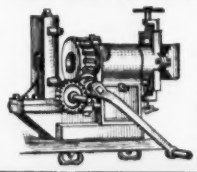

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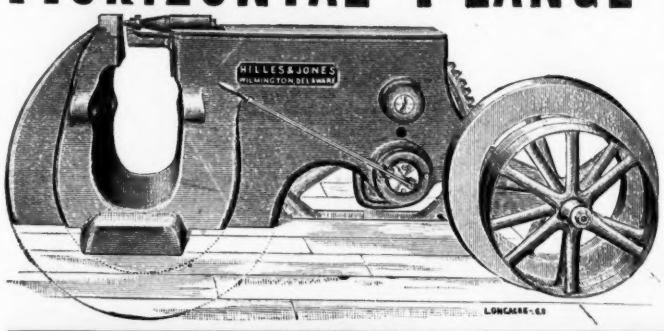


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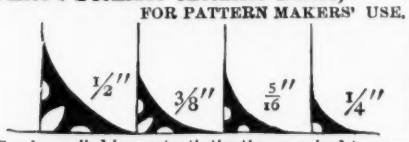


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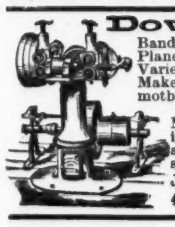

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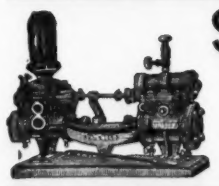

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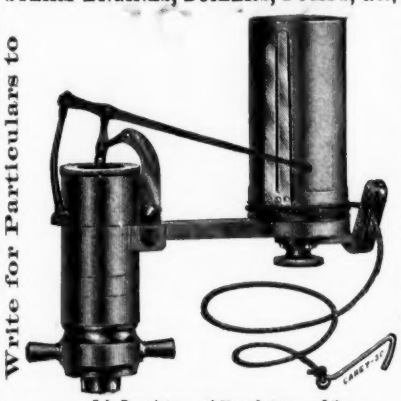

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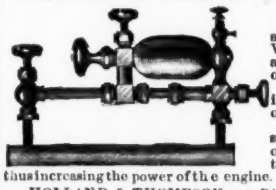

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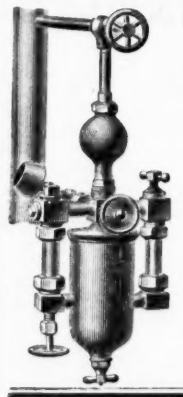

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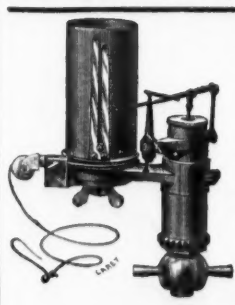

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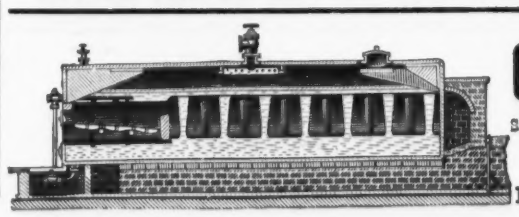

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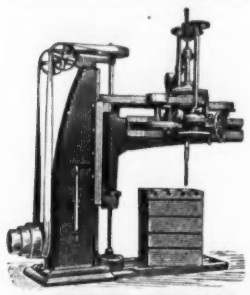

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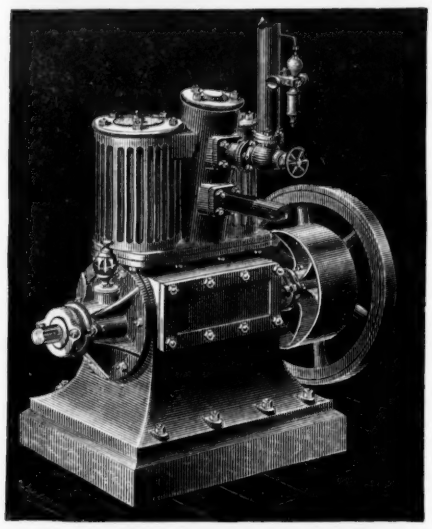

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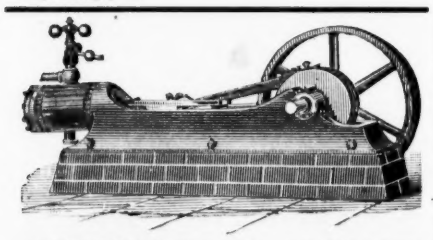

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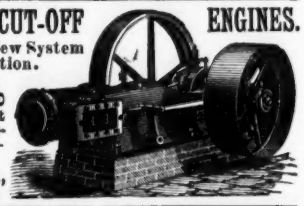

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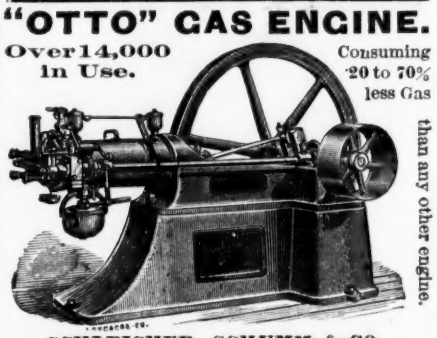

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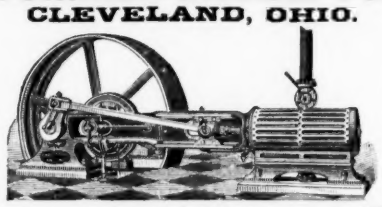

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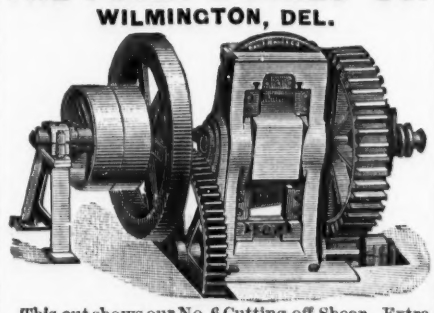

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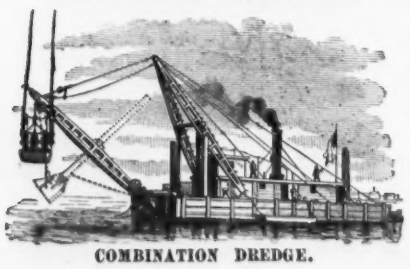
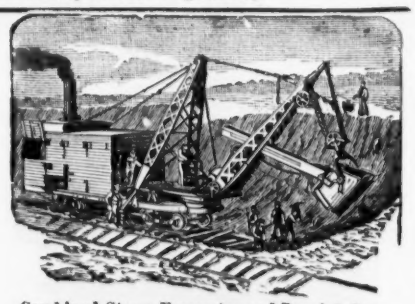


COMBINATION DREDGE.



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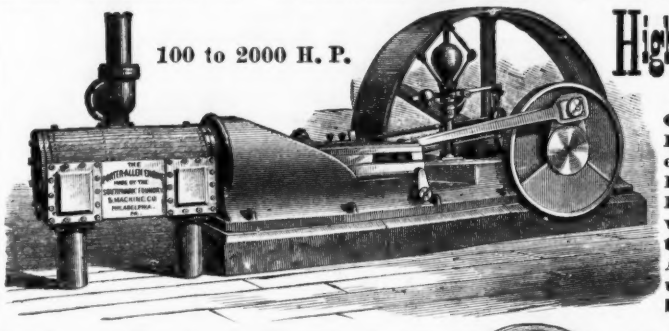
100 to 2000 H. P.



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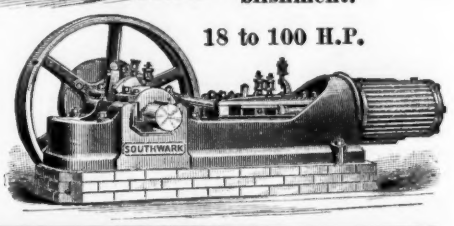


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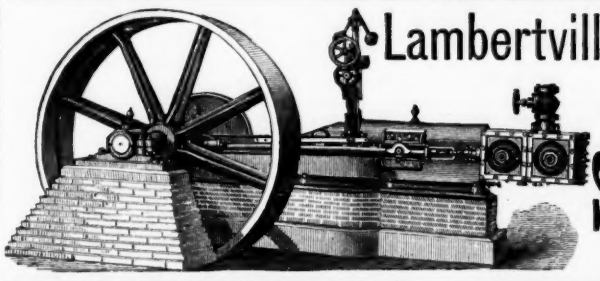
## Lambertville Iron Works,

MANUFACTURERS OF

PATENT AUTOMATIC CUT-OFF

## Steam Engines

LAMBERTVILLE, N. J.



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## WRIGHT MACHINE CO.

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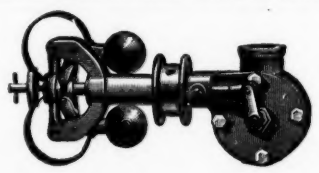

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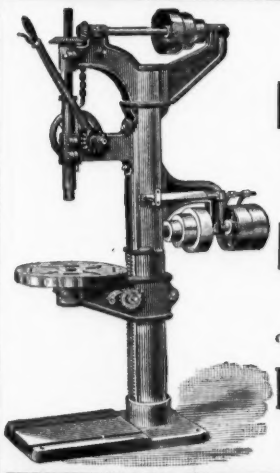

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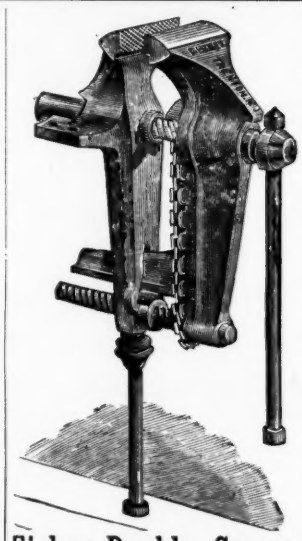

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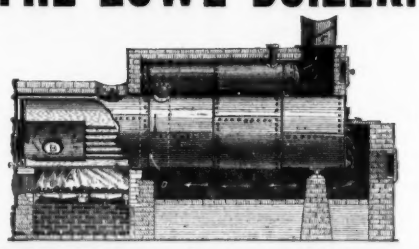

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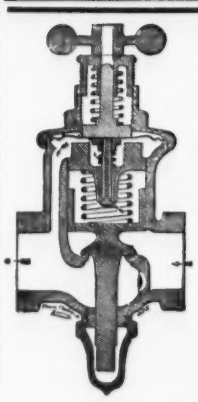

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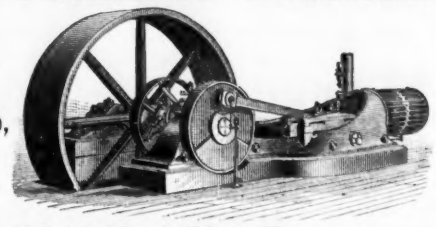

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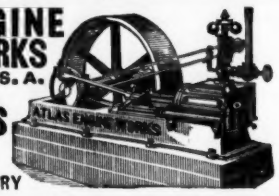


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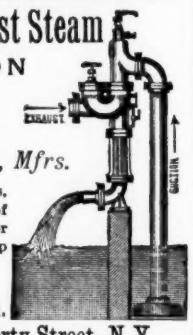


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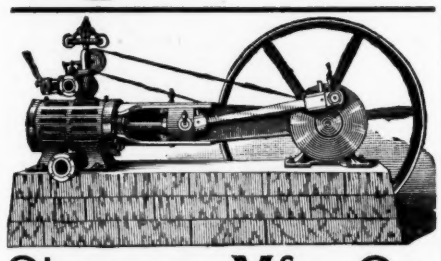

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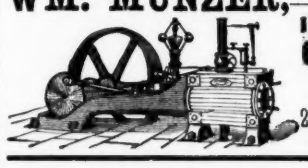

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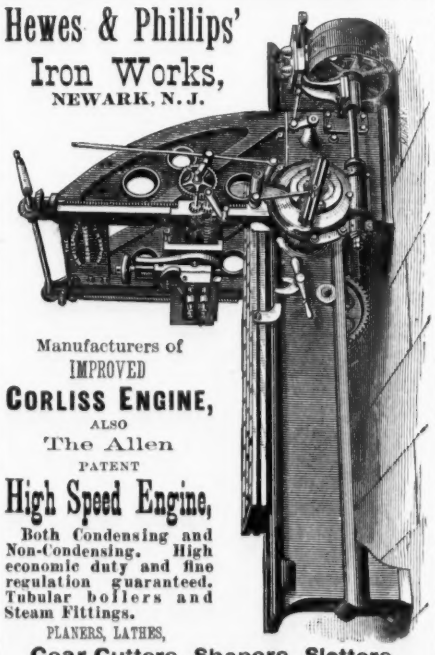

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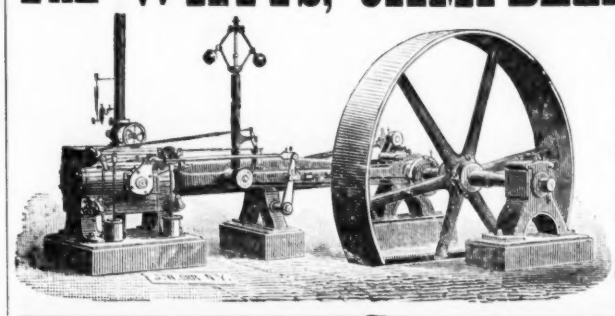

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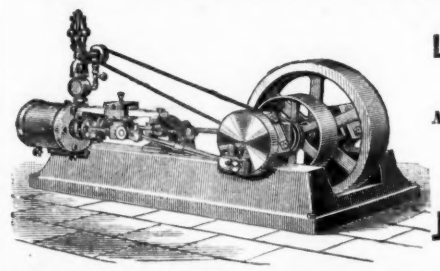

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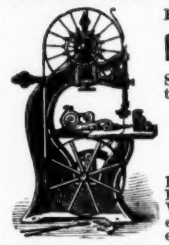

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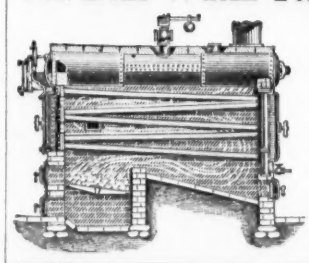

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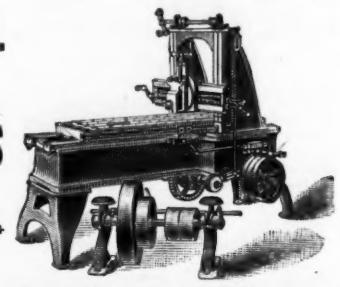

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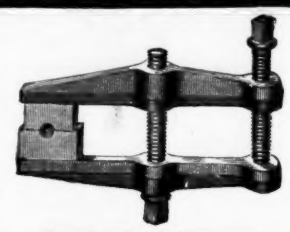

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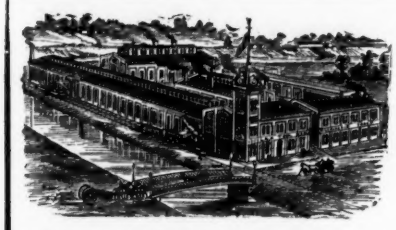

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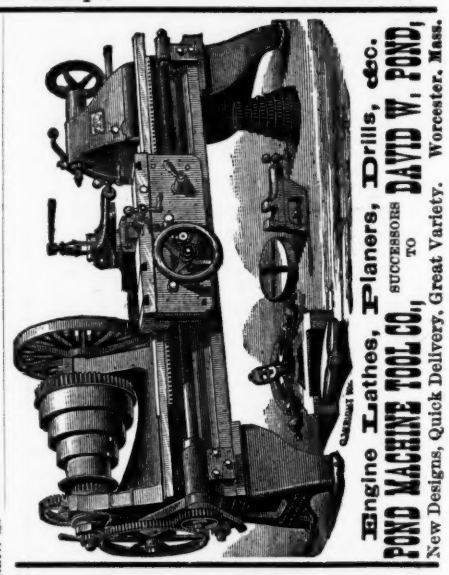

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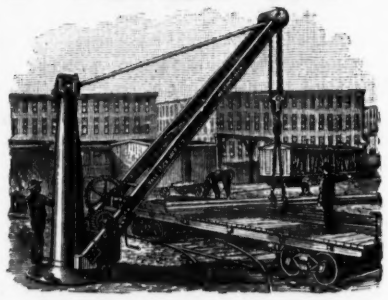

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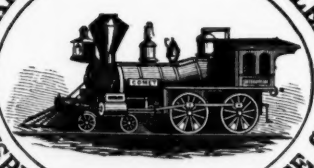

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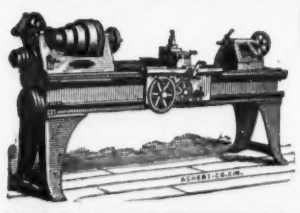

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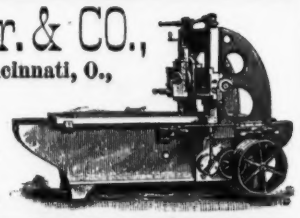

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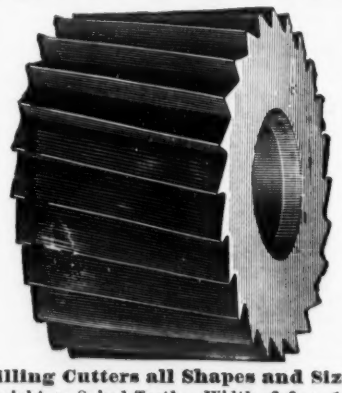

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